FOOD MANUFACTURE

Incorporating Food Industries Weekly

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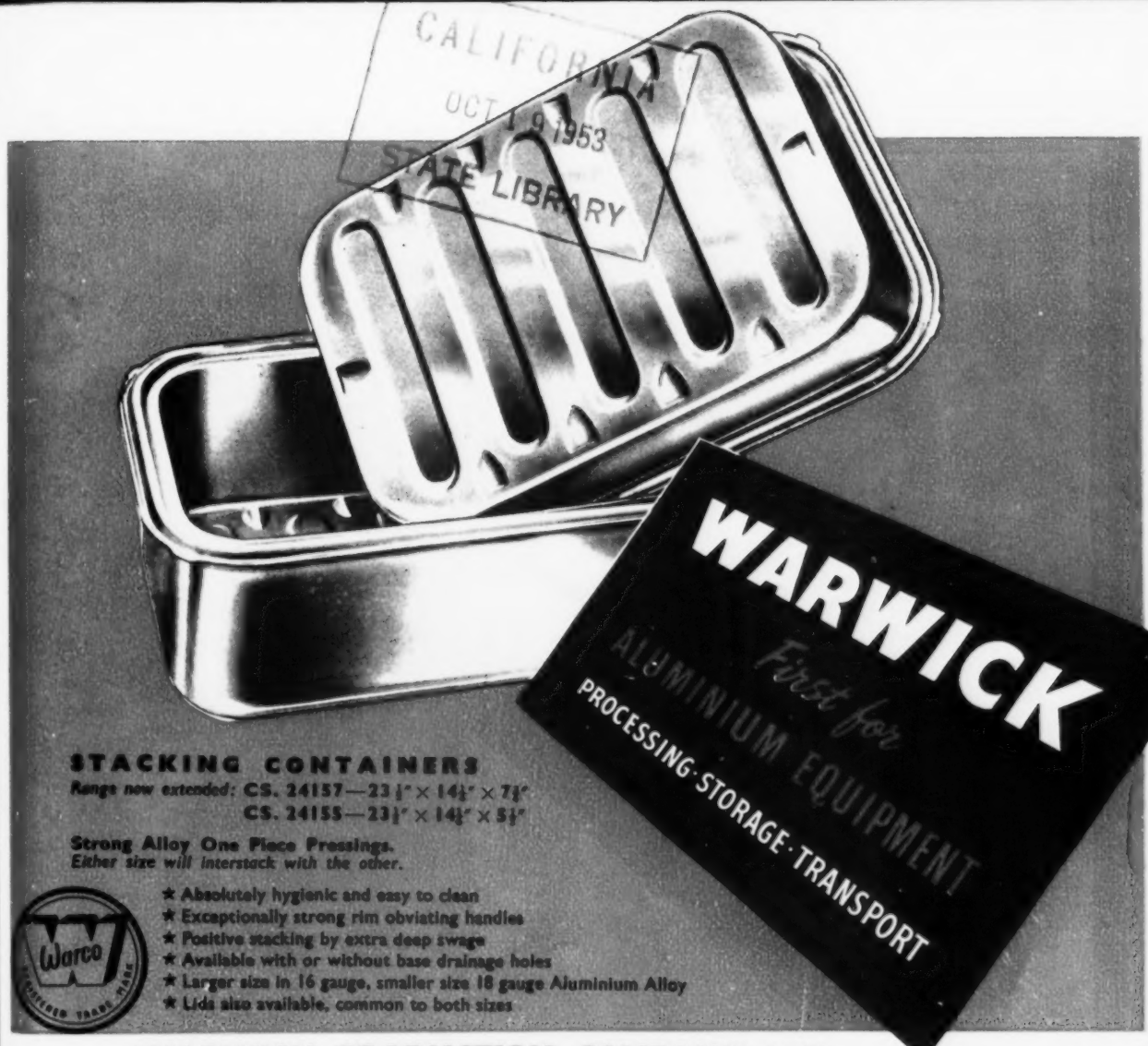
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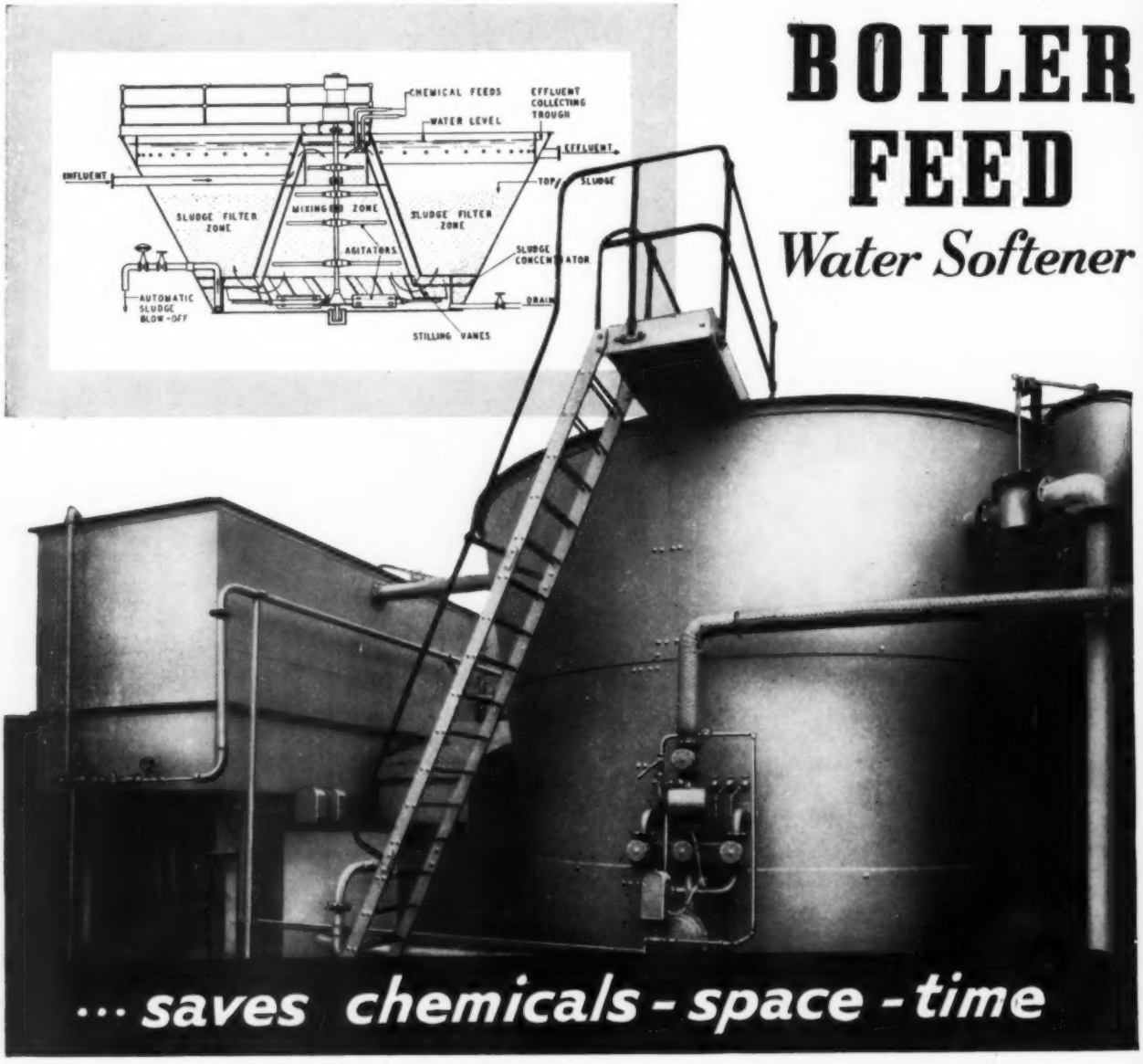

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Vol. XXVIII. No. 10 · Published Monthly · October 1, 1953

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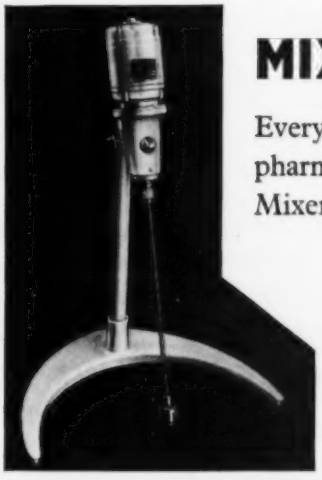
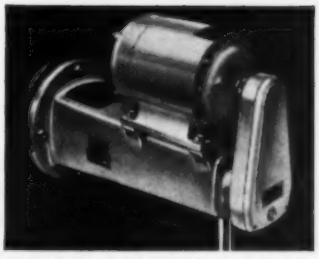
Published by Leonard Hill Limited, Stratford House, 9, Eden Street, N.W.1. Euston 5911

***Subscription Rates:** 1 year $8; 3 years $20; payable in advance*





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FOOD MANUFACTURE

Vol. XXVIII, No. 10 October 1, 1953

White Bread Again

THE recent return of the white loaf after 11 years' absence has been celebrated by the publication of leading articles in the national and provincial newspapers according to their individual style.

One paper ecstatically acclaimed the Freedom that had come to "the people" of Britain, and confidently predicted that its extra cost would not deter them from buying the new loaf in large quantities. Another, while asserting that the national loaf had become an asset to the nation, asked: if white bread became sufficiently popular to make it unnecessary to subsidise national bread, would the national loaf disappear?

The writer of an article in *The Economist* was more objective and devoted considerable space to a discussion of the bread subsidy. "It is clearly right," he states, "that Government money should be spent in an attempt to clarify the nutritional facts about bread. It is harder to justify, on the ground of public health, a bread subsidy which cost £41 million in the last financial year and which will cost rather more this year even if 10 per cent., say, of the demand is switched to unsubsidised bread. If it were right to subsidise bread, then it would be logical to go on subsidising all the foods that are important in a properly balanced diet, including some, such as fruit and vegetables, that have not hitherto been subsidised. A better alternative is surely to try, by education and propaganda, to make people choose the food that is good for them. If a price differential in favour of national bread is important for reasons of nutrition, a tax on white flour would be just as effective as a subsidy on national flour. Apart from the general aim of reducing government expenditure and introducing realism into prices, it is always unsatisfactory to subsidise food that is not rationed, especially a food so freely wasted as bread. It must be hoped, therefore, that the limited freedom that millers and bakers will enjoy is the step before complete freedom."

The reactions of the trade have been varied. One baker found that only eight per cent. of his customers would promise to try the new loaf, but was confident that those who did buy it would like it and stand by it. Another expressed a different view: "I want to keep my customers off the new loaf as long as possible. It costs 6½d. against the national 4½d., and if they buy white bread they have less to spend on my other lines."

An almost general opinion is that the small baker will now be able to bake his hand-made speciality loaves and thus regain the ground lost to the large bread manufacturers, who may be adversely affected.

It is never possible to please everybody; but there is one set of people who will have another lease of life—the white-*versus*-brown-bread controversialists.

Algaculture for Protein?

A MONOGRAPH on the commercial production of algae as a source of food, in which it is stated that basic research problems have been solved to the point when pilot plant production can be regarded as practical, has recently been published by the Carnegie Institution. *Chlorella*, a small unicellular organism, seems the most likely alga to be chosen, using for its culture a combination of sunlight, air containing 5 per cent. carbon dioxide, and a simple non-sterile medium containing nitrates and trace elements.

The entire chlorella organism is edible and half its weight is protein. Tanks or concrete troughs can be used as cultivation vessels, from which the algal "crop" can be removed by gravitational settling or centrifugal separation. Solar energy is utilised with maximum efficiency at low illumination intensities, a fact that enables high production to be secured by agitating the medium so that each organism receives direct sunlight intermittently. With all agricultural crops, much of the solar energy is used in building up non-edible weight, *e.g.* stalk with cereals, and foliage with root or pulse crops, and none produce such a high proportion of protein as *chlorella*, with its gross yield of 17½ tons per acre.

Dr. Burlew, editor of the monograph, says that 30 grams of protein could be fed daily to every person in the world from a million acres devoted to algaculture, that is from an area about the size of the county of Dorset!

Impressive small scale research has been carried out by the Carnegie Institution at Washington, by two sponsored research organisations in the United States, in Japan, in Israel, and in Britain, where preliminary work has been sponsored by Imperial Chemical Industries.

Oils from Ceeral Bran

A PROMISING industrial process for the extraction of a vegetable oil from rice bran has been developed by the American rice-growing industry. It is a mild flavoured oil, and is claimed to be remarkably resistant to rancidity, and to be suitable for use as a lubricant. A useful residue from the process is a wax with a high melting point. As the United States rice industry is relatively small, it is obvious that this new product has bigger possibilities in the more dominant rice-growing countries. Rice bran oil should certainly be considered as a British Colonial development.

There seems to be plenty of room for investigating the production of vegetable oils from other cereals. In Scotland, 10,000 tons of oatdust and 8,000 tons of oat cockle are annually produced in oat milling. The ether extract figures for oil in oatdust and cockle are as high as 11 and 5·8 per cent. respectively. For wheat bran the figure is between 4·3 and 4·5 per cent. Today these materials find a useful market as animal feedingstuffs but this certainty of disposal may not endure.

The Value of Subjective Assessment

ALTHOUGH physicochemical measurements can be made to a high degree of accuracy, the assessment of quality and similar abstract factors is dependent on considerations of individual preference and reactions. Such evaluations are difficult to carry out precisely, but there are various spheres of activity where the method of subjective judgment can be applied to form a valuable supplement to physical measurements, and in view of the increasing use of tasting panels by food manufacturing concerns, a recent essay on the subject by Dr. E. C. Bate-Smith (*Research*, **6**, 1, 1953) will be of interest.

Subjective assessment is a laborious and responsible business. Not only is an expert technical knowledge required of the matters or materials under consideration, but the disciplinary requirements of mathematical statistics and experimental psychology must also be met. Even when these requirements are satisfied in high degree, "reliability" and "validation" are relative terms, dependent themselves on the individual likes, dislikes, predilections, and prejudices, as the case may be, of the sponsor and the critic of the results of the test.

Perhaps the most urgent immediate need is a means of reducing substantially the manpower requirements of this type of work, without reducing—in fact, if possible increasing—reliability and validity. The most likely way in which this can be achieved is by visualising as clearly as possible the aim of the test and the precise capacity in which the subjects should be called upon to perform—whether as specimen consumers, as measuring instruments, or as something of each.

As an example of a subjective assessment serving practical and necessary ends, Dr. Bate-Smith instances the dual test on dried egg reported to the Food Group of the Society of Chemical Industry (*J. Soc. Chem. Ind.*, **68**, 78, 1949). Two groups of widely different constitution, each consisting of about 40 members from various income levels, acted as consumer panels with a view to ascertaining at what level of staleness dried egg ceased to be acceptable to the general public. They had submitted to them, cooked in a familiar form, the same three samples of dried egg varying in quality within a range thought likely to include the borderline of acceptability. Both groups indicated, to an extremely close degree of concurrence, the same level of acceptability, which could then be expressed in terms of the scale used by the expert panel in assessing the samples.

The advantage of this two-panel method, one to measure specified properties, the other to act as specimen consumers, relating the responses of the second to the findings of the first, is that assessments of the magnitude or intensity of single factors abstracted from the totality of properties of the material submitted to the panel, may claim the rank and status of measurements, whereas the responses elicited from consumer panels are at all times conditional on the class of consumer represented and the circumstances of consumption envisaged.

Food Legislation

SOME interesting comments on the new Food and Drugs Bill, now being drafted for presentation to Parliament, were made by Mr. C. A. Adams, C.B.E., B.Sc., F.R.I.C., at the sixteenth summer meeting of the North of England Section of the Society of Public Analysts and Other Analytical Chemists.

The Bill was of outstanding importance not only to public analysts and chemists engaged in food manufacture, but also to the general public, as buyers and consumers of food. On the interest shown by the general public much of the success of the Bill would depend, and it was to be hoped that this interest would be stimulated by all concerned, because legislation seldom ran ahead of public opinion.

One of the main items in the Bill concerned those powers sought to transfer temporary wartime legislation into permanent form, as well as any other powers that might be necessary to deal with the addition of chemicals to food, whether intentional in the course of manufacture, or adventitious in the form of pesticide residues, or in any other way. It was in the latter respect, said Mr. Adams, that a change in the law was undoubtedly necessary having regard to the increasing number of chemicals used in the manufacture of foods.

These matters had recently been the subject of official enquiry in the United States of America.

They had also been dealt with at length by Dr. J. R. Nicholls in his recent Presidential Address and were summed up from the official angle by the Lord President of the Council in the Annual Report of the Advisory Council on Scientific Policy.

If the Orders under the Defence (Sale of Food) Regulations, 1943, were included in the new Bill, it would make them unalterable without appeal to Parliament. Instead, fuller powers to make such Orders would be sought in the Bill, and they could then be re-enacted. Among these Orders Mr. Adams allotted pride of place to the Labelling of Food Orders and the Food Standards Orders. All these had been enforced by the Food and Drugs Authorities as though they were part of the Food and Drugs Act.

As the result of the experience in the working of these Orders by these Authorities and food manufacturers, he was of the opinion that we had seen some welcome progress in what might be called the "co-operative administration of food legislation."

If the range of the Food and Drugs Act were to be extended to cover problems arising from the use of chemicals, pesticide residues, and the sale of sub-standard products, now was the time to make recommendations. Once the Bill became law, further changes might be long delayed.

What is a Sausage?

FROM time to time the winding up of the Ministry of Food forms the subject of Press comments. If this were to happen in the near future, the Minister would certainly retire with flags flying. At the beginning of the year he withdrew the Meat Products Order, but to make up for it he has brought back white flour and white bread, including the much debated addition of prepared chalk to all flour except that ground entirely from whole wheat. He has issued recommendations for tin and for fluorine in foods, a new Preserves Order, and finally the Artificial Sweeteners in Food Order with all the accessories necessary to implement it, including the Syrup and Treacle (Amendment) Order, 1953, the Saccharin (Revocation) Order, 1953, and the Food Standards (Saccharin Tablets) Order, 1953. But a matter on which all would like to have enlightenment remains. How much meat should a sausage contain?

When the Minister first issued the Meat Products Order, 1952, an *ad hoc* committee, consisting of public analysts and members of the trade and of the Government laboratory, was set up to reconsider existing methods of analysis for meat products. As a result of its deliberations, the method originally proposed by Stubbs and Moore, with slight modifications which had been found advisable during the years between 1919 and 1952, was recommended and published in the *Analyst*, 1952, pp. 543-544. Sausages, therefore, can be analysed with a fair degree of accuracy unless they contain both soya flour and dried milk; even then the analysis would probably not be to the disadvantage of the manufacturer.

This does not, however, answer the question: "What is a sausage?" The Minister has said that there shall be no standard, but that everyone should be able to buy the type of sausage he wants. Public analysts have said that they expect no lowering of the standards that were imposed when there was a shortage of meat and they do not believe that the public want this, considering that they are unable, in spite of the apparent belief of the Minister to the contrary, to look at the sausage they are eating, to taste it, and to exclaim that it contains 57·5 per cent. of meat.

The trade feels that the public should be entitled to buy a cheap sausage, should it wish to do so, and that it should be possible to buy good sausages with a 30 per cent. of meat content. We have considerable sympathy with such an expression of goodwill towards the less affluent members of the public, but are still waiting to see such a sausage sold at a price cheaper than that at which sausages were sold before controls were removed. In other words, it is useless to ask for a reduction in the quality of the sausage unless a corresponding reduction in price is made. Until this happens most local authorities propose to support their public analysts in holding to the standards in force before the Meat Products Order was revoked. They are usually prepared to call their analysts into Court to give evidence as to what they believe a sausage should be and are prepared to supply evidence in Court regarding the prices at which sausages are being sold. It may, however, be left to the Lord Chief Justice to deliver one of his learned judgments, this time on "What is a Sausage?"

Food Labelling Problems

IN the Annual Report for 1952 of the Medical Officer of Health for the Metropolitan Borough of Chelsea is included Mr. Thomas McLachlan's report of 400 samples of foods and drugs examined by him under the Foods and Drugs Act, from which it was pleasing to note that no outstandingly heinous contraventions of the regulations had occurred during the year.

At the conclusion of his report, Mr. McLachlan makes some interesting comments on the withdrawal of the Labelling of Food Advisory Service of the Ministry of Food, and although he made these some months ago, the complications resulting are still liable to occur. Mr. McLachlan says:

"During the year the Minister of Food withdrew the Labelling of Food Advisory Service which had been operating very successfully for some years. Whilst this service has no legislative power, it provided a most useful liaison between food manufac-

turers and packers on the one hand and Local Authorities on the other. Any manufacturer seeking advice was given the benefit of the experience of the legal and chemical advisers of the Minister and most manufacturers, having been given this advice, accepted it loyally.

"From the point of view of the public analyst the service was invaluable because, whenever he was in doubt regarding the description or labelling of any product, he had only to contact the Ministry to know whether the matter had received the approval of the Ministry and, if so, whether the Ministry had been informed correctly of the composition of the food. With the disappearance of this service every public analyst will be obliged to express his own opinion regarding the labelling of a product and its composition in regard to such label. In the event of the Local Authority supporting the public analyst it will have to be decided whether the matter is one which should be discussed amicably with the manufacturer or whether legal action should be taken.

"It is thus seen that the advice and opinion of one central advisory service is being replaced by some 350 critics, who will not necessarily all be of the same opinion. The increase in eventual cost will be enormous and cannot but cause irritation to reputable manufacturers."

Changes in Food Habits

THE well-intentioned superimposition of new foods on the diet of the inhabitants of the countries in which they have hitherto been unknown, may produce results surprising to those introducing them.

A study by Dr. Margaret Mead and other anthropologists of the impact of industrialisation on backward peoples (which will be available shortly in volume form through UNESCO), cites the case of the disruptive effect on Greek family life of the introduction of raisins into the children's diet. The nutritionists of a Child Care Service persuaded mothers to try raisin bread and other items at family meals, causing friction because of divergence between the diets of the parents and the juveniles.

Another example of resistance to change has been described in a study made in the United States during the war by a committee on food habits of the National Research Council. "We upset dietary balance by persuading Spanish-American children in New Mexico to eat white bread instead of cold corn *tortillas*," it was stated, "when their main source of calcium came from the lime water in which the corn of the *tortillas* had been soaked. We persuaded their mothers to substitute canned spinach for wild greens, and when there was no money to buy spinach, the children went without greens.

"Such attempts have met with resistance in the past. In a Chinese district a public health nurse was rejected because she tried to persuade parturient mothers to eat vegetables instead of a diet of fried chicken. These women had been eating mainly vegetables all their lives, and had looked to this period when their special status would be acknowledged by this particular diet."

Returning to this "new aspect of technical assistance which is taking on supreme importance," as expressed by Dr. Mead *et al.*, it must involve recognition of regional prejudices. One example of those quoted relates to West Africa where older people think it undignified to eat oranges and teach their children not to eat them because the fruit will make them "soft." Yet the habit among the same people of eating raw meat seasoned with mineral salts encourages the spread of intestinal diseases, and recognition of this fact must be achieved before improvement will result.

Friction, if not disruption, from the same causes is not necessarily confined to "backward peoples." We have witnessed minor conflicts even in the best regulated families in Britain, based on differences of opinion between seniors and juniors as to what is "good for you."

Oranges and Lemons

HAVING changed its packing methods for fresh lemons, the Californian industry is now doing the same with oranges. Instead of being wrapped in paper and packed in wooden boxes, lemons are packed unwrapped in cardboard cartons about half the size of the wooden boxes. Advantages are saving of labour in wrapping and hand-packing and in transport costs.

The change would not have been possible but for the introduction of the anti-fungal chemical biphenyl which, when placed along a short ledge inside the carton or on fibre pads at top and bottom of the carton, sublimes into the air-space of the carton and acts as an anti-decay agent.

Additives are being used to mask the strong odour of biphenyl but, even when masked, it may prove more troublesome with oranges than with lemons. Current research is therefore being directed towards the search for a better chemical "fungistat" or more effective formulations of masked biphenyl.

The application of this cheaper method of packing to oranges attracts Californian producers whose main market is fresh fruit, only about 25 per cent. of their crop going to the juice and concentrate industry. It should keep down the retail price of fresh oranges, and thus help producers to meet the rising competition of canned juice.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of articles on the subjects covered. Books on food would also be considered.

Radiation from Fission Materials for Food Preservation

L. E. Brownell*

Research by a number of investigators has shown that a variety of types of ionising radiation can be used to destroy micro-organisms. This has led to consideration of using ionising radiation to sterilise foods and thereby prevent food spoilage resulting from the action of micro-organisms. One such application might be the substitution of radiation sterilisation for thermal sterilisation in the processing of canned meats and other foods. An advantage of the use of radiation in the processing of canned foods would be the elimination of the requirement of processing at elevated temperatures. Another advantage would lie in the instant penetration of radiation, as compared to the slow penetration of heat. However, the use of radiation has numerous disadvantages and presents some new problems, described in this article.

X-RAYS have never been considered seriously as a means of sterilising foods because of the high cost of using the machines for this purpose. Electron accelerating machines, such as the Van de Graaff machine and the Capacitron, have been developed and improved during the past several years and their use in sterilising foods and other products has been demonstrated experimentally.[1, 2]

Use of Radioactive Wastes

Current interest has developed in the use of gamma radiation as a means of sterilising foods because of the possible availability of large amounts of radioactive wastes produced as by-products in the operation of nuclear reactors. Gamma radiation has the advantage of appreciably greater penetration than either electrons from accelerating machines or X-rays from conventional 200 KV machines. Gamma radiation obtained from radioactive wastes could be much cheaper than X-radiation from machines; however, as yet only limited cost information on these wastes is available.

The Atomic Energy Commission of U.S.A. has contracted with the Engineering Research Institute of the University of Michigan and other universities to investigate the possible industrial uses of radioactive wastes. The Michigan Memorial Phoenix Project† supports research of the uses of atomic energy which will benefit mankind. This project is separate from the contracted research conducted by the Engineering Research Institute and has no connexion with the Atomic Energy Commission. Both of these projects at the University of Michigan have conducted experiments on the uses of gamma radiation.

The research was begun in the summer of 1951 when the Fission Products Laboratory of the Engineering Research Institute received a one-kilocurie cobalt-60 gamma source of the type described by Manowitz.[3] Cobalt-60 gamma sources serve as a substitute for the fission products and are quite expensive because they are made by neutron bombardment in a reactor. However, they are useful laboratory tools and as such are more convenient and probably as cheap as waste fission products processed on a small scale. More important, the kilocurie sources are now available whereas processed gross fission products are not.

It has been found that these kilocurie sources vary somewhat in their strength and it is necessary to calibrate each source separately. A calibration of the Michigan kilocurie source gave a value of 79,000 rep (in air) as of July 1, 1952.[4] One rep represents an energy absorption dose of 83·8 ergs per gramme in air or about $3{\cdot}6 \times 10^{-6}$ BTU per pound.

Fig. 1 is a sectional view of the container for the Michigan kilocurie source. A pneumatic lift is used for charging and removing the aluminium tube of $1\frac{3}{8}$ in. diameter, in which the samples are placed for irradiation. The small diameter for irradiation of samples has limited the usefulness of this kilocurie of cobalt-60. A larger source, 10 times as powerful and of

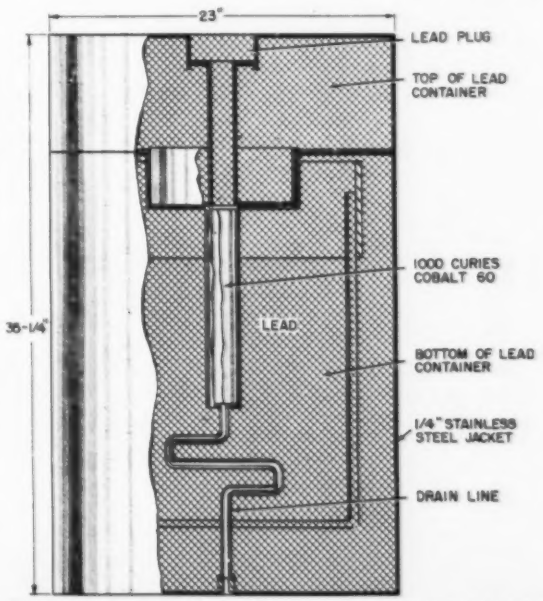

Fig. 1. Sectional view of the container for the Michigan one-kilocurie source.

* Associate Professor of Chemical Engineering, University of Michigan; Director of Fission Products Laboratory; Co-Supervisor of Michigan-Memorial Phoenix Project 41.

† The Michigan Memorial Phoenix Project is a memorial to the Michigan dead of World War II. The Regents of the University of Michigan voted to "create a War Memorial Centre to explore the ways and means by which the potentialities of atomic energy may become a beneficent influence in the life of man, to be known as the Phoenix Project of the University of Michigan."

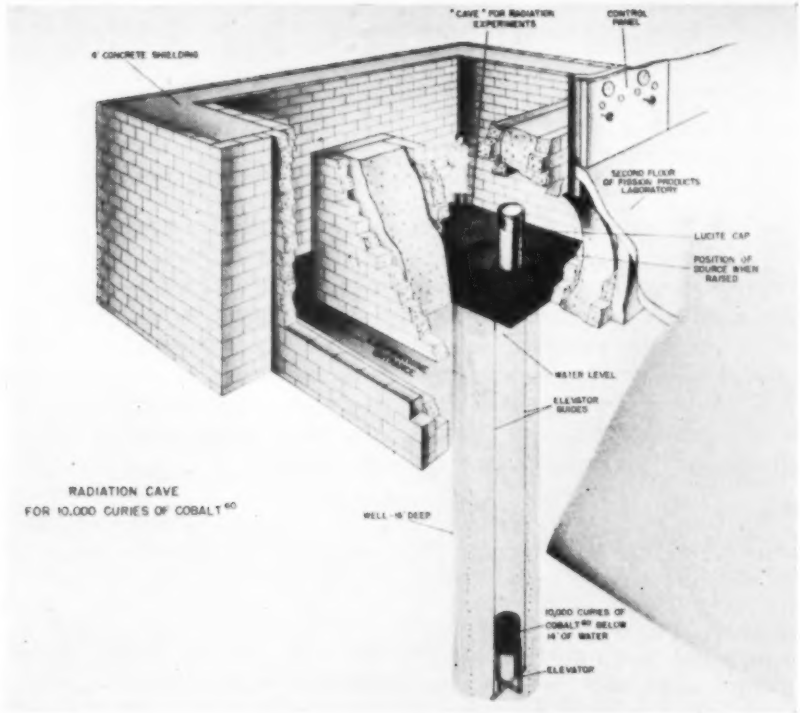

Fig. 2. Cut-away view of radiation cave for 10 kilocuries of cobalt-60 gamma radiation.

different design, installed in the Fission Products Laboratory early this year, has greatly increased the range of experiments. For example, with the new source it is possible to sterilise whole hams in size number 10 tin containers, and to irradiate sufficient volumes of food to conduct appropriate animal feeding experiments. Fig. 2 is a cut-away drawing of the new installation.

Sterilisation by Gamma Radiation

One of the first of the questions investigated was the dosage required to destroy various micro-organisms. The Michigan Memorial Phoenix Projects 20 and 41 have supported a study of the effects of gamma radiation on micro-organisms.[5] A wide variety of bacteria, moulds, yeasts, and viruses were tested and spore forming bacteria were found to be the most resistant organisms tested. *B. subtilis* and *Cl. botulinum* require a dose of approximately 2·0 to 2·5 million rep (measured in air) to destroy all the spores and bring about complete sterility. Table I gives typical data obtained with *B. subtilis*.

Much smaller dosages were required to destroy the non-spore-forming types of bacteria. For example, a dose only about one-sixth as large was sufficient to destroy the micro-organisms, *Escherichia coli*, *Proteus vulgaris*, and *Lactobacillus arabinosus*. A similar small dose (less than 400,000 rep in air) destroyed the yeast, *Saccharomyces cerevisiae*, and the moulds, *Penicillium notatum* and *Aspergillus niger*. At the left of Fig. 3 two Petri dishes with normal growths of *Aspergillus niger* and *Penicillium notatum* are shown, while at the right of this figure the Petri dishes are shown to be free of any mould growth as a result of gamma irradiation.

Tests were also made on the flora of raw and pasteurised milk. A dose of 2·04 million rep (in air) gave a count of zero in both raw and pasteurised milk. A gram-positive sporulating bacillus isolated from canned evaporated milk was found to have about the same resistance as *B. subtilis*. A dose of 2·04 million rep (in air) gave a count of zero.

It might be added that two pathogenic viruses, psittacosis virus and mouse pneumonitis, have been treated with gamma radiation. Both viruses were inactivated and rendered non-infective by relatively small dosages of greater than 0·085 and less than 0·26 million rep (in air). These experiments show that these pathogens are much more susceptible to radiation than sporulating bacteria.

Animal Feeding Experiments

A few months after receiving the one-kilocurie gamma source, some preliminary animal feeding experiments[6] with food exposed to gamma radiation were conducted at the University of Michigan. The results showed no difference in health, growth, etc., between the animals fed irradiated whole milk and those fed the controls. All milk samples were irradiated in polyethylene bags in the one-kilocurie cobalt-60 source, receiving a doze of slightly over 2,000,000 rep (in air).

The milk was reconstituted Klim, prepared as a four times concentrate and diluted just before feeding by the addition of a salt solution. This milk constituted the entire diet with the exception of one leaf of lettuce, which was not irradiated, added each week. It was emphasised that this experiment was only exploratory and that any conclusions from the data were preliminary and contingent upon further testing, both with feeding experiments and more refined methods of assay for individual components of the diet. This would require microbiological assays for amino acids and the setting up of long-term feeding and breeding experiments.

The proposed long-term animal

TABLE I

EFFECT OF DOSAGE OF GAMMA RADIATION ON COUNT OF B. SUBTILIS

Radiation Dose, million rep (in air)	*Count of B. subtilis*	*Per cent. Reduction*
0	18,000,000	0
0·34	960,000	94·6+
0·68	202,000	98·8+
1·02	20,500	99·9+
1·35	14,450	99·9+
1·70	75	99·9+
2·04	0	100·0

feeding experiments have been discussed with the personnel of other laboratories that have conducted similar experiments using food sterilised by electron bombardment from accelerating machines. There has been some discussion of the proposed experiments in correspondence with representatives of the Food and Drug Administration.

Range of Future Work

It has been established that there is some loss in vitamins as a result of irradiation, and there seems to be no need to prove this again with an expensive animal feeding experiment. However, there remains yet to be proven whether or not a diet in which the main caloric intake is from irradiated food is wholesome and nutritious, and capable of supporting normal growth without any undesirable or toxic effects.

In the experiment proposed, the main caloric intake should consist of a suitable mixture of carbohydrates, fats, and proteins. In addition, a portion of the water intake should be in the irradiated food. Some of the effects of irradiation are believed to result from the formation of hydroxyl radicals from water; therefore, it is important that the food to be irradiated should not be in the anhydrous state. The suggestion has been made that meat would be a more suitable and convenient food than reconstituted milk because of the difficulties of obtaining normal feeding with a complete liquid diet.

With these different considerations it was decided that the animal feeding experiment should involve the feeding of four generations of rats. A diet should consist of irradiated food supplemented with vitamins and minerals. The irradiated food may consist of 50 parts of canned meat such as Swift's Beef for Babies, 25 parts of carbohydrates such as corn starch, 10 parts of fat, 10 parts of dry casein, the remaining five parts being used to provide a supplement of mineral and non-irradiated vitamins.

This diet has been suggested because it is believed that with a study involving reproduction, lactation, etc., it will be necessary to supplement the minced meat with carbohydrates, fat, inorganic salts, vitamins, and probably proteins for a completely satisfactory diet.

Tests with Irradiated Foods

In the Fission Products Laboratory food has been packaged in plastic containers and in glass tubes and preserved from spoilage by micro-organisms for many months. Vegetables such as peas, spinach, asparagus, broccoli, and carrots seem to be the most satisfactory foods for preservation by irradiation. In these studies, it was found that these foods undergo very little flavour change; in fact, the peas and carrots seem to be slightly sweeter and are definitely more tender as a result of irradiation. There is a tendency to bleach, which is a disadvantage in the case of green peas but may not be a disadvantage in the case of asparagus and carrots. There also seems to be a softening of the foods with a certain amount of cell destruction, as evidenced by an increase in tenderness, a decrease in crispness, and the loss of some fluid from the cells. For example, irradiated peas cooked for three minutes have the same tenderness as the control cooked for six minutes.

Off-flavours in Protein Foods

Flavour tests made in the Fission Products Laboratory indicated that protein foods of animal origin are not as satisfactory as fresh vegetables when treated by irradiation. In general, protein foods of animal origin undergo two types of flavour change: the proteins develop a strong animal-like odour and taste, and the fats develop a tallowy or rancid odour and taste. These off-odours and off-flavours are volatile and in many instances disappear upon cooking. However, there seems to be little promise at present of irradiating foods such as milk, cottage cheese, and eggs without the development of off-flavours that would be objectionable to a large percentage of the public, although some individuals are unable to detect these except when very great dosages of radiation have been used. Rats fed irradiated milk accepted it as readily as the controls.

Irradiated Meat

It was discovered that irradiated bacon, ham, and corned beef were relatively free from any off-flavours after these products were irradiated and then cooked. Representatives of a major packing company tasted samples of irradiated bacon, corned beef, and ham and stated that the bacon had a flavour which would be quite acceptable and that the corned beef was very good. The ham which was tested seemed to have a slight off-flavour after irradiation. How-

Fig. 3. Effect of gamma radiation on common moulds.

ever, other hams have been tested which were found to have no off-flavours after irradiation and cooking.

It was believed that sodium nitrite and nitrate used in processing these meats protected the flavour molecules during irradiation. Other tests have been made using sodium nitrite and nitrate with raw minced beef, and a noticeable improvement in flavour was observed. Concentrations of sodium nitrite as low as 100 parts per million appear to be effective in preventing flavour change. The Food and Drug Administration permits up to 200 parts per million of sodium nitrite in cured meats, using sodium nitrite and/or sodium nitrate. One hundred parts per million of sodium nitrite does not affect the flavour of raw meat when cooked but does have a tendency to give the cooked meat a reddish colour rather than a greyish colour.

The Effect of Radiation on Trichina Larvae

In studies at the University of Michigan[7] under Michigan Memorial Phoenix Project 58, it has been found that ionising radiation is effective in preventing the normal development of the causative agent of trichinosis (*Trichinella spiralis*).

Irradiation of trichina larvae in infected meat with either 200 KV X-rays or cobalt-60 gamma rays (1·17 and 1·31 Mev) is effective in producing the following results, depending on the dose employed.

First, the larvae can be killed by a radiation dose of one million roentgens.

Second, the maturation of the larvae to adult forms is inhibited by cobalt-60 gamma rays in a dose of 18,000 rep and by a 200 KV X-ray dose of 14,000 rep.

Third, the female adult forms which develop from the irradiated larvae are sexually sterile if the dose of gamma rays is 12,000 roentgens, or the dose of X-rays is 7,000 roentgens.

These results indicate a new approach to the problem of prevention of trichinous infection in man. In order for a person to contract trichinosis, he must ingest meat (principally pork) containing live trichina larvae. The larvae develop into sexually mature adult forms in the small intestine where they reproduce, the new generation of larvae entering the tissues of the host. Approximately 1,000 larvae of the second generation are produced by each female. The critical phase of the development of the parasite in the intestine of the host can be inhibited and the infection prevented by irradiation of the meat, before ingestion, at the relatively low dose levels previously mentioned —up to 20,000 rep.

Conclusions

The possible future of the process of gamma ray sterilisation of food is promising in spite of the hurdles yet to be negotiated. The penetration of gamma radiation gives it a great advantage over other types of radiation. For example, if a radiation dose of 2,000,000 rep is required for sterilisation, the average radiation by electron bombardment may be 4,000,000 rep (8,000,000 or more near the surface and the minimum of 2,000,000 in the centre as compared to an almost uniform 2,000,000 rep with gamma radiation). Where irradiation results in flavour change, this difference in uniformity of dosage is an important consideration.

There are disadvantages of using gamma radiation such as the longer time required to sterilise with gamma rays, the inability to stop gamma radiation except by shielding, and the present unavailability of cheap gamma sources. However, at present gamma radiation appears to be the only type of ionising radiation which may prove to be feasible for sterilising food, packaged in containers of the usual size.

In summarising, it may be stated that three important steps must be taken before food can be preserved by gamma radiation on a commercial basis in the United States: (1) food sterilised by gamma radiation must be proven acceptable to the Food and Drug Administration's requirements and to consumers' tastes; (2) industry must show an interest by supporting research work to develop the process in terms of commercial feasibility; and (3) the Atomic Energy Commission must make suitable fission product gamma-ray sources available in sufficient quantities and at reasonable costs.

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Speeding up Breadmaking

SEVERAL phases in the preparation of the dough are eliminated by the use of a fast process with an enclosed high-speed kneading machine recently reported from Hungary. The kneading time is extended (20 to 30 minutes), but this is more than counteracted by the elimination of the leavenings which take six to eight hours, and of the supplementary kneadings. The method is claimed to produce a homogeneous loaf.

However, far more yeast is required than usual, 1·5 kg. per 100 kg. flour, but the specific utilisation of material is improved as a result of less evaporation and loss of carbon dioxide. The process was worked out with a five litre experimental machine, and a larger machine is now under construction for carrying out investigations on a semi-commercial scale.

FUTURE ARTICLES

AMONG the articles to be published in forthcoming issues of FOOD MANUFACTURE are the following: "The Measurement of Air Concentration in Large Steam Spaces during Air Venting," "An Irish Food Factory," and "The Peeling and Potting of Shrimps."

The World Food Problem

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The problem of feeding the population of the world is epitomised in the statement: "during the past 13 years the world's population has been increasing by 1·0 per cent. annually and food by only 0·7 per cent." It is generally recognised that about two-thirds of the world population is inadequately fed, that the problem is to increase the food supply for these people, or help them to feed themselves, and that in Britain is produced only half the food required, the remainder being imported. What is not so widely realised is the connexion between these facts, and the certainty that the shortage of food will eventually affect us as well as "the poor natives."

BEFORE the war, an astonishing proportion of the food that reached the world's markets was bought for feeding Britain; as much as 20 per cent. of the sugar, 30 per cent. of the wheat, 50 per cent. of the eggs, cheese, and mutton, 75 per cent. of the beef, 80 per cent. of the butter, and 90 per cent. of the bacon and ham that was available for sale was brought to these islands;[1] despite this, one-fifth of our people were underfed.

Now, the situation has begun to change; no longer are underfed countries willing to sell us their food; they are, instead, eating it themselves. For example, India by raising her annual *per capita* consumption of fat from eight to nine pounds, has dropped her export of groundnut oil almost to zero—a fall of some quarter of a million tons. The time will come when these countries, which vastly outnumber us, will bid against us in the world's markets for what food is available. Then, perhaps too late, it will be realised that a world shortage of food affects Britain as well as the millions of South America, India, China, and Africa.

The Population Problem

The magnitude of the population problem has been recently restated by Le Gros Clark.[2] In the 17th century, the world's population increased by 40 per cent.; in the 18th century by 60 per cent.; and in the 19th century by 100 per cent. Extrapolation is always dangerous, but the size of future populations can be assessed approximately. Titmuss[3] classed the world into Zone A, where the main factor controlling population is the voluntary birth rate, since the death rate is too low to allow much further reduction; Zone C, where the main population regulator is still premature death; and Zone B, which includes those countries in transition from C to A.

The Western World, already numerically inferior, belongs to Zone A, and its population is approaching stability. Zone C comprises the greater part of the world's population, and includes India, China, other Asiatic countries, and Africa. While we were still in Zone B during the first half of the 19th century, our population doubled. When the C countries enter Zone B similar increases can be expected before their numbers become stabilised. By assuming the time taken for Zone C countries to reach the status of Zone A to be the same as was required by the western world, Le Gros Clark gives an estimate of the future population of the world as eight to 12 thousand million. One problem is to shorten this time lag.

Approach to Stabilisation

The question can be posed in another way. It is estimated that in India, where half the population dies before reaching the age of 22 years, 50 per cent. more food is required. If that were available, the population is expected to increase, not at the present rate of 1·5 per cent. annually but by 2·0 to 2·5 per cent., so doubling in 30 years. If the present food supply for the present population should be increased by 50 per cent., then in 30 years it will need to be increased by 300 per cent. to cover the new population. If the food can be made available in that time and the standard of living rapidly raised, it is hoped that education, public health, and public opinion will result in an approach towards a stabilised population. If the problem cannot be solved in 30 years then it would appear to be almost insoluble.

Factors governing Food Production

The population aspect of the problem is more difficult than that of food production. Much of the knowledge needed to increase food production is already available; action is what is needed. But the question of control of sizes of population is fraught with religious and social difficulties, as witness the recent abrupt end to the discussion of the question by the World Health Organisation.

The quantity of extra food required is enormous, especially to us who are told that an increase of only 6 per cent. in industrial production would solve all our economic problems. A conservative estimate has put the extra food at 50 per cent. increase in cereals, 100 per cent. in meat and fish, 125 per cent. in fat, 150 per cent. in milk and derivatives, and 300 per cent. in fruit and vegetables.[4]

Russell has outlined some of the factors limiting food production at present.[5] There are the inherent factors of the site, lack of soil or water, lack of plant nutrients, and too short a growing season; there are destructive factors which harm the crop; and there are human factors. One of the principal of these is the skill and ability of the farmers. Even in this country the better farmer can produce 50 per cent. more milk from his cows than the less efficient, and it is recognised that in every country the leading farmers produce almost double the average.

Closely allied with lack of skill

and ability is lack of knowledge; the scythe has only recently been introduced into Afghanistan and the stone mill into Nyasaland.

Other obvious factors limiting food production are inherent soil fertility and climate. Enormous increases in yield can be produced by the correct use of fertilisers; Russell estimates possible increases in yields of cereals and grasses of as much as 10 to 20 per cent., even in Britain. A quarter of a hundredweight of nitrogen per acre can increase the yield of starch equivalent by about 3 cwt. per acre, while crude protein can be increased by 1 to 2 cwt. for each cwt. of nitrogen used. It is interesting to note Pirie's remark[6] that the increased production of straw resulting from nitrogen fertiliser can be three times as great in terms of energy as the ammonium sulphate applied.

A combination of better plant varieties, better water management, and simple manuring has, in the case of rice in India, produced a 100 per cent. increase in yield, and under some favourable conditions up to 500 per cent.

Soil Erosion

Another brake on production is caused by soil erosion, which can reach staggering proportions. For example, at the height of the notorious Dust Bowl catastrophe, which first brought the attention of the city dweller to the problem, 300 millions of tons of soil in the Middle West of America were lifted in a single storm and carried to the coast.

Considerable progress has been made in controlling erosion since that time, but apart from this it would seem that its proponents have overstated their case. For despite the gloomy prognostications of Vogt,[7] it has recently been stated[8] that this area of the United States is now producing more grain than it did before the Dust Bowl conditions of the middle thirties.

Pests and Disease

Pests, parasites, and disease take their toll of our food, both vegetable and animal. It has been calculated by FAO that the losses of grain between harvest and consumption were 65 million tons per year, an amount equal to the total passing into international trade after surviving insect and fungal attacks and weed competition.[9] On the average in Britain, 30 per cent. of the crop is lost during growing, harvesting, and storing. It is calculated that one rat, both by eating its (our) food and spoiling more, ruins 1 cwt. of food per year, and it is said that there is one rat for every human being in the world.

The Human Factor

All these limitations to food production provide technical problems, many of which are well on the way to solution, but the human factor has provided even more severe problems in the way of social, economic, political, and religious barriers which are not so easily overcome. The holy cow is permitted to consume human food but cannot itself be eaten; food production is limited and surpluses are destroyed because overseas markets cannot be found for them; farmers restrict production because of the fear of abundance; changes in land tenure and new methods are contrary to social customs and traditions; irrigation schemes cannot be proceeded with because the sources of water are shared between several countries which cannot agree.

The Achievements of FAO

The growth of population and the limitations of production pose the problem, and the problem does appear to be adequately recognised. What is not so widely recognised is the progress that is being made towards solving the problem, the achievements of FAO, and the improvements taking place in the more backward countries.

In a world torn by hate, where every country seems to be at the throat of the next one, there would not appear to be much room for international co-operation. What a pleasing contrast to our newspaper headlines is a report from FAO telling us that an Egyptian entomologist is advising in Syria, a Philippine forestry expert serving in Thailand, a Korean veterinarian and a Peruvian cotton expert in Ethiopia, an Iraqui date expert in Saudi Arabia, an Argentine fisheries expert in Ecuador, a Chinese silk expert in Afghanistan, a Japanese silk expert in Burma.

We have become accustomed to Productivity Teams whose duty it is to learn the "know-how." FAO is making great progress in passing the agricultural "know-how" on to many of those countries which are so far behind.

Application of Scientific Methods

The type of progress that can be made when scientific methods are vigorously applied to food production has been described by Yudkin.[10] Israel started tackling its food problem seriously in 1948, when the new State was created. The demand for food increased greatly in the next four years with mass immigration. However, the production of food grew faster than the demand so that while the population doubled, the production of fish tripled, egg production rose by 150 per cent., and milk production, vegetable production and cattle doubled.

These successes were achieved by a variety of factors. One-eighth of the cultivated land is irrigated; the drainage of swamps has doubled the cultivable area; and malaria has been virtually abolished. As part of the drainage scheme, artificial ponds have been created which have contributed towards the increased supply of fish, for it is recognised that an acre of fresh water planted with fish can be made to produce more animal protein than the same area under pasture. Probably the most important factor has been a great increase in mechanisation.

Importance of Better Farming

These improvements in food production show what can be done by the application of modern methods to backward farming, but even in Britain, where the standard of farming is so efficient relative to the rest of the world, new and better methods have been applied in recent years with considerable improvements in production. Since 1939, farm production has been increased by 40 per cent., achieved largely by

trebling the use of fertilisers, multiplying the tractors sixfold, the combine harvesters eighty-fold, installing 1,000 grass driers where hardly any existed, and finding a use for 55 million idle acres.[11] The improvements show how much further improvement there can be, and it has been suggested that the partnership of power and chemistry might bring us to a new agricultural revolution.

Need for New Methods of Production

Apart from technical improvements in the practice of farming, it is surprising how much progress can be made simply by administrative changes. Herklots[12] has described a simple change in method of marketing which has resulted in a great increase in the quantity of fish and vegetables available at Hong Kong. By selling their produce by public auction instead of through a middleman, the fishermen and farmers have produced sufficient food to abolish malnutrition in an area which was rife with beri-beri and pellagra before the war.

Despite these advances in technique and increases in yields it still remains a fact that the rise in food production is not keeping pace with the increase in population. The world is not feeding its peoples as well as in 1939, much less raising their standards of nutrition from the pre-war level to adequacy. The great increases in quantities of food needed even now, together with the enormous increases expected in the population, mean that future requirements will be of staggering proportions. There is a search for new methods of producing food to supplement, and not be a substitute for, orthodox farming.

Cultivation of *Chlorella*

As we are so dependent upon the green plant and photosynthesis for our food, it is reasonable to ask whether sufficient use is being made of our current source of energy, sunlight. Photosynthesis is a very inefficient process as much of the light is reflected or absorbed by inactive surfaces, and in an attempt to trap and use the energy more efficiently, the cultivation of photosynthetic micro-organisms, particularly *chlorella*, is being investigated.[13]

Under ideal conditions of nutrients, including carbon dioxide, protection from other organisms, and optimum temperature, yields equivalent to 50 tons per acre per year have been obtained, although as pointed out by Pirie[14] it is quite unrealistic to compare yields obtained under these pampered conditions with normal crops growing under varying conditions but usually lacking warmth and nutrients and depending upon the meagre carbon dioxide supply in the atmosphere. *Chlorella* has, however, great advantages in the plasticity of its metabolism and variations in conditions can be made to produce high fat-low protein or low fat-high protein products of almost any desired composition.

Protein from Plant Leaves

Plants exist and more could be developed that make better use of the sunlight than an ordinary crop, but with our present methods we cannot make adequate use of them. Methods are available,[14] however, whereby full use could be made of highly efficient plants. Instead of producing crops of which only the fruit or the root is used, and which frequently have to remain in the ground to ripen, although no longer photosynthesising, a nearly continuous green cover could be maintained of plants adapted for efficient trapping of sunlight and able to withstand repeated cropping of the leaves.

The greatest use could be made of these leaves by fractionating them into proteins (which are present up to 30 to 40 per cent. in young leaves), which are suitable for non-ruminants and perhaps man, a fluid extract which could be used as cattle feed or as a medium for fermentation, and a fibrous residue which still contains residual protein and carbohydrates and is suitable for ruminants or, if very fibrous, for fuel.

Quite apart from changing our domestic crops, there are already in various parts of the world abundant leafy wastes from crops grown for other purposes which could be utilised in this way.

Other Foods from Natural Sources

Other new methods for obtaining food from natural sources include fertilising the sea, food from plankton, wood waste, and seaweed, and the production of edible yeast. This last has already been adopted on a large scale,[15] and is technically and economically successful but does not rank as one of the "preferred" foods. At 1s. 2d. per lb., food yeast in terms of protein is only one-tenth of the price of lean meat as well as a valuable source of the B vitamins. Its use at the present time, however, is restricted largely to feeding cattle where its price compares unfavourably with other feedingstuffs.

The problem of the nutritionist in this case, as indeed with any new food, like snoek and whale meat (and in earlier days potatoes and sugar), is to get people to eat what is acknowledged to be wholesome and nutritious. It has been suggested that to develop a taste for new foods a start must be made with the children, and also new foods must not attempt to mimic established foods but must stand in their own right as something new, newly presented and cooked, and eaten in their own way. Unfortunately, little success is being achieved with these novelties, even among the hungry peoples.

Scope of Synthetic Methods

The field of synthetic chemistry, which has had so many dramatic successes placed to its credit in recent years, is making a considerable contribution towards solving these problems. All the vitamins are now produced synthetically and more cheaply than can be extracted from natural sources; all the amino acids can be synthesised, and although, as yet, few cheaply enough to be usable as food or food supplements, these few include the ones that matter.

It does not seem likely that the chemical factory will produce bulk foods, such as fat, carbohydrates, and proteins at any forseeable time, although considerable success had been achieved in Germany in the bulk production of synthetic fats.[16] Outputs up to 2,000 tons per year have been achieved, although there is doubt

as to the harmful effect of their metabolic products. In this direction it appears more likely that the biologist will be of some help in producing fats which are fully metabolisable from yeasts and moulds.

Synthesis of Amino Acids

Where the chemist is already of considerable help is in the synthesis of those amino acids which are lacking in certain protein foods and which by addition can greatly improve the quality of these foods.[17] For example, crops which give maximum yields can be grown as feedingstuffs and their lack of quality supplied by synthetic vitamins and amino acids, for example, nicotinic acid to supplement maize and soya, lysine to supplement wheat products and cotton seed, as well as riboflavin, thiamine, and choline. In this connexion the abolition of beriberi in the Philippine Islands by the addition of synthetic vitamin B_1 to the white rice shows how the chemist can improve man's food directly, although he is so often blamed for the opposite.

All these methods for increasing the world's food supply demonstrate the truth of the statement that we already have the technical knowledge, the skill, and the ability to solve our present problem, partially if not completely, if only political and economic considerations would permit this to be put into effect. Much further information is required, however, not only for the sake of scientific knowledge but also because the rapidly increasing size of the problem will soon outpace our present knowledge.

In the realms of orthodox farming we need to find out more about methods of increasing production, developing more efficient varieties of plants and animals, and preventing losses through pests and diseases.

Vegetable *v.* Animal Proteins

We do not even yet know whether the animal protein in our diet can adequately be replaced by vegetable proteins. This is a question of the greatest importance for the economic use of land, for if man could or would eat his farm crops directly instead of converting them *via* his animals into more pleasant foods, he could live on the produce of less than an acre in the form of sugar beet and potatoes, but if he wants beef then nearly 14 acres are needed to support him.

A radical change in this direction has been suggested in Israel,[18] where despite great increases in food production only 750 of the daily supply of 2,600 Calories per head are grown at home. The suggestion is that the production of meat, poultry, and eggs should be largely replaced by sugar beet, groundnuts, sweet potatoes, pulses, and fruits. If this great change is carried into effect it will provide extremely valuable information on this question.

We do not know with any precision the area of cultivable land in the world. We cannot say how much increased production can be expected from increased yields and how much from the cultivation of new land.

A Gigantic and Urgent Problem

In the realms of newer methods and novel foods we need to know a great deal more before we can say whether they offer a useful contribution to the problem. In this connexion all practical methods of attempting to increase our food supply must be investigated at the same time, for the problem is gigantic and urgent. The danger is that the protagonists of one particular method are so certain of their own remedy that they create the impression that there is no need to investigate the others. Economics of a new process cannot be regarded as a barrier in times when the cost of raw materials can rise tenfold in a few months, and when technologists can reduce production costs to one-hundredth in a few years. It did not take long before the rare and expensive drug penicillin became widely available and cheap. Quite apart from these considerations when one is starving expense is no object.

The greatest need is to overcome the economic and political barriers to increased food production. This is not a problem for scientists as scientists, but it is certainly a problem for scientists as citizens.

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The Leonard Hill Technical Group

Articles published in some of our associate journals in the Leonard Hill Technical Group this month include:

Manufacturing Chemist.—Assay of Thioglycollic Acid, Part II; Animal Health Products; A New Pharmacological Laboratory.

Petroleum.—Some Physical Properties of Mineral Oils under High Pressure, Part I; Second International Congress on Rheology; Instruments and Control Gear for Chemical Plant.

Atomics.—Industrial Applications of Radioactive Materials; Some Facts concerning Radiation Biology.

World Crops.—Cocoa in the South Pacific; The Clove Industry in Zanzibar and Pemba.

Fibres (Natural and Synthetic).—Fibres for Pulp and Paper Manufacture; Detergents in the Wool Textile Industry.

Muck Shifter.—Pozzolan Concrete from Fly Ash.

Skim Milk Powder for Use in Bread

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When ordinary skim milk powder is added to fat-free bread doughs, it reduces the volume and quality of the resultant loaf. A modified skim milk powder of good keeping qualities has been developed which, when added to such doughs, gives bread of excellent quality. The skim milk is given severe preheating, and small quantities of potassium bromate, glyceryl monostearate and fully hydrogenated high-melting fats are added before drying. The modified skim milk can be dried by the roller or spray process. Commercial trials with this skim milk powder, containing 0·02 per cent. potassium bromate, 4 per cent. fully hydrogenated stearin, and 1 per cent. glyceryl monostearate, showed it to have excellent baking quality. Skim milk powder of this type is now being produced in Australia.

IN much of the good agricultural land in the temperate regions of the world pasture is the most productive crop, and the dairy cow the most efficient animal in converting that crop into high quality protein, calcium salts, riboflavin, and other food constituents. In Australia and New Zealand much of this food is lost to human consumption by the feeding of skim milk to stock, this re-cycling of the food giving a return of only about 15 per cent. In Australia 64 per cent. of the protein, 67 per cent. of the calcium, and 70 per cent. of the riboflavin are lost in this way.

Salvaging Milk Solids

To direct these large quantities of milk solids to human consumption requires firstly drying for preservation and reduction in bulk, and secondly the finding of suitable food forms. One of the most effective methods of using dried milk solids is to add them to bread.

While milk has been added to bread for many years in the U.S.A., the average addition now being about 3·5 per cent., bakers in England and Australia have maintained that the addition of more than a small amount of skim milk solids spoils the quality of the bread. The work here described was undertaken to provide a milk powder which when added at the 6 per cent. level or even higher to a straight water dough would improve the physical as well as the nutritive properties of the bread, while leaving its type and flavour virtually unaltered.

Raising the Protein Content of Bread

The addition of 6 per cent. of non-fat milk solids to bread markedly enhances its nutritive value. Wheat flour protein, like most vegetable proteins, is deficient in one or more of the essential amino acids—in this case lysine and tryptophan. The addition of 6 per cent. of skim milk solids not only significantly raises the protein content of the loaf, but also supplements these deficient amino acids, particularly lysine.

Fairbanks[1] showed that rats receiving 6 per cent. and 12 per cent. milk bread were significantly larger than those on ordinary bread. Similar studies by Riggs *et al.*[2] corroborated this. Henry and Kon,[3] however, found that neither 3 per cent. nor 6 per cent. dry skim milk had any supplementary effect on the biological value of flour protein when fed at the 8 per cent. protein level.

The following figures show the improvement in protein, calcium, and riboflavin content upon the addition of 6 per cent. dried skim milk to bread:

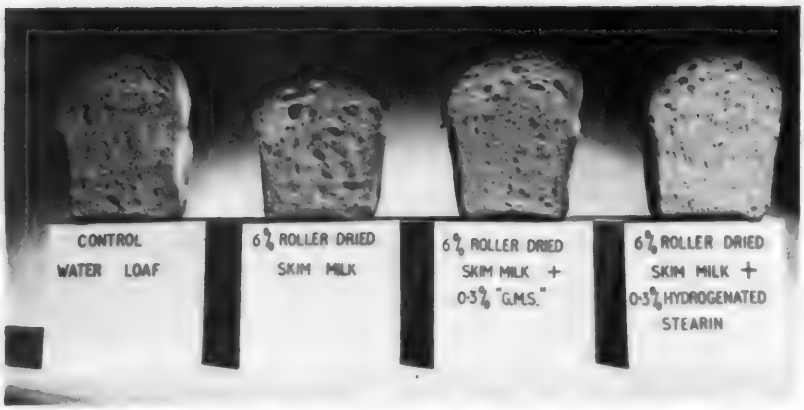
	White bread	*White bread with 6 per cent. skim milk powder*
Protein	8 per cent.	9·6 per cent.
Calcium	30 mg. / 100 g.	90 mg. / 100 g.
Riboflavin	0·2 ug. / g.	0·8 ug. / g.

Treatment of the Milk

The adding of skim milk powder to bread was investigated by Hutchinson *et al.*[4] It was found that when 6 per cent. of commercial skim milk powder was incorporated in ordinary white doughs the resulting loaves were immature, the crusts harsh, and the crumb coarse and open with frequent cores. The addition of emulsified fat along with skim milk powder gave a loaf superior to the control. The universal use of shortening in bread in the

The effect on bread structure and loaf volume of dried skim milks with and without fat.

The investigations here described were conducted at the Bread Research Institute, Sydney, and are published by permission of the *Australian Journal of Dairy Technology*.



The effect on bread structure and loaf volume of skim milk solids with G.M.S. and hydrogenated stearin.

U.S.A. no doubt explains the ready adoption there of the practice of adding milk powder to bread.

To simplify the baker's task to a single addition to the bread, the fat was incorporated with the milk before drying. Skim milk powders containing approximately 20 per cent. of mutton fat, beef dripping, or lard had excellent baking quality, but difficulty was encountered with the keeping quality as the fats oxidised readily.

Further studies were therefore undertaken to find a stable skim milk product which could be added to bread with improvement to its physical properties.

In all these studies due account was taken of the evidence provided by workers in the U.S.A. that milk for baking requires severe preheating. Greenbank *et al.*[5] showed that heat treatment of milk improved its baking quality. Since that time a considerable amount of attention has been given to the conditions for optimum treatment. A fairly severe heat treatment appears necessary, but there is a reasonable degree of tolerance in the conditions. Holding the milk at 85°C. for 30 minutes before drying gives satisfactory results for both spray and roller dried powders. Higher temperatures for shorter times have been used but there is always a danger of scorching.

Ashworth and Kruger[6] showed that maximum loaf volume was obtained when 50 per cent. to 90 per cent. of the whey proteins had been denatured by heat, and minimum loaf volume when 15 per cent. to 30 per cent. had been denatured, insufficient heat treatment thus giving worse results than none at all. Kraft and Morgan[7] found that excessive heat treatment deprived milk of some of its growth promoting efficiency.

The test baking procedure used throughout the studies is described in the appendix.

Experimental Work

Table 1 gives the results of test bakes using spray and roller dried skim milk powder with and without fat additions. Both the spray and the roller powder had adequate preheat treatment.

The loaf volumes given in Table 1 essentially confirm the conclusion of Hutchinson *et al.*[4] that fat or fat emulsions overcome the depressant effect of skim milk on loaf quality.

The Use of Glyceryl Monostearate

Glyceryl monostearate (G.M.S.) is used extensively overseas and to a limited extent in Australia as a crumb softening agent in bread. Commercial G.M.S. is a complex mixture containing about 40 per cent. monoglyceride. Before being added to bread G.M.S. must first be emulsified with hot water.

Table 2 gives the result of test bakes in which G.M.S. and skim milk powder were used. The G.M.S. was added to the dough as a 20 per cent. emulsion in water. Optimum results were obtained with 1 to 1·5 per cent. of this emulsifier, *i.e.* 0·2 to 0·3 per cent. G.M.S.

G.M.S. emulsion was added at varying levels to concentrated skim milk and the mixtures both roller and spray dried. To prepare the mixture for drying the concentrated skim milk (S.G. 1·10) was heated to about 70°C. and the appropriate amount of 20 per cent. G.M.S./water emulsion added with vigorous stirring. To

TABLE 1

THE EFFECT OF ADDING SKIM MILK POWDER TO BREAD WITH AND WITHOUT FAT

Skim milk powder	*Fat*	*Loaf volume c.c.*	*Texture*
—	—	550	3
6 per cent. Roller	—	480	2
6 ,, ,, Spray	—	490	2
3 ,, ,, Roller	—	480	2
3 .. ,, Spray	—	490	2
—	2 per cent. Lard	570	4
6 ,, ,, Spray	2 ,, ,, ,,	580	5
—	2 ,, ,, ,, as emulsion	580	5
6 ,, ,, Spray	2 .. .. .. as emulsion	590	5

TABLE 2

THE EFFECT OF ADDING G.M.S. WITH SKIM MILK POWDER

Skim milk powder	*G.M.S. Per cent.*	*Loaf volume c.c.*	*Texture*
—	—	550	3
—	0·1	580	5
—	0·2	590	5
—	0·3	590	5
—	0·4	580	5
—	0·5	560	4
6 per cent. Spray	—	490	2
6	0·1	560	4
6	0·2	560	4
6	0·3	560	4
6	0·4	550	4
6	0·5	540	4
3	—	490	3
3	0·1	550	4
3	0·2	560	5
3	0·3	560	5
3	0·4	550	5
3	0·5	550	5

TABLE 3

THE EFFECT OF ADDING G.M.S. BEFORE DRYING THE MILK

Skim milk powder	*G.M.S. dried with the skim milk Per cent.*	*Loaf volume c.c.*	*Texture*
5·0 per cent. Roller	—	490	2
6·1	0·1	540	4
6·3	0·3	560	4
6·5	0·5	550	4
6·0 .. .. Spray	—	480	2
6·1	0·1	530	3
6·3	0·3	540	4
6·5	0·5	550	4

prevent formation of a surface layer, the stirring was continued while the concentrate cooled.

These powders were not reconstituted before adding to test doughs, but mixed through the dry flour. Results are reported in Table 3. The products were of satisfactory baking quality.

Baker and Mize[8] showed that brittle fats, such as fully hydrogenated cottonseed oil, when finely divided, gave a marked improvement to loaf volume and texture. When a liquid fat was supersaturated with a brittle fat, further improvement in baking quality was observed. The only brittle fats readily available in Australia are hydrogenated peanut oil and hydrogenated stearin. Water emulsions containing 50 per cent. of these two fats were added to skim milk before roller drying, and the resulting powders tested for baking quality. In addition, the emulsions and ordinary skim milk powder were added separately to test doughs. The emulsions were stabilised with 10 per cent. G.M.S.

Tables 4 and 5 give the loaf volumes and textures obtained when using hydrogenated stearin and hydrogenated peanut oil respectively. Both emulsified hydrogenated stearin and emulsified hydrogenated peanut oil improved the volume and texture of bread with and without the addition of skim milk powder. At the lower rates of addition, the hydrogenated fats appear more effective when dried with the milk than when added separately.

The Bromate Requirement

The improver which is always used in bread manufacture contains an oxidising agent, usually potassium bromate. Harris and Bayfield[9] showed that the addition of dry milk solids increased both the bromate tolerance and bromate requirement of flours. Our experiments confirmed this. We were also able to show that bromate added to milk remained effective after drying, and that in the presence of G.M.S. or hydrogenated stearin, the bromate requirement was below 0·002 per cent.

The observation of Melville and Shattock[10] that ascorbic acid or dehydroascorbic acid could be used to replace potassium bromate was confirmed. Whether ascorbic acid remained effective after drying was not determined.

A small batch of skim milk powder containing 5 per cent. G.M.S. and 0·017 per cent. potassium bromate was dried on a commercial double drum roller drier. The product dried quite satisfactorily, although not as well as ordinary skim milk powder. Commercial trials, using 3 per cent. to 6 per cent. of this treated skim milk powder, were conducted in bakeries throughout Australia. Very little change in normal baking procedure was necessary. The milk powder was mixed into the flour before the addition of any liquor. Water absorption was increased by approximately 1 gallon for every 12 lb. milk powder used. The milk slowed the rate of dough maturing rather more than it did in the laboratory, but this was overcome either by lowering the salt content, raising the dough temperature, or raising the amount of yeast used.

In all but one trial the quality of the milk loaves was at least equal to that of the water loaves. The texture of the milk loaves was superior to that of the control loaves and the crust was of better appearance and character. After three days the milk loaves appeared significantly fresher than the water loaves. The bread in

TABLE 4

THE EFFECT OF ADDING HYDROGENATED STEARIN WITH THE MILK POWDER

Skim milk powder	*Hydrogenated stearin Per cent.*	*Loaf volume c.c.*	*Texture*
—	—	550	3
—	0·1 added separately	560	4
—	0·2	580	5
—	0·3	580	5
—	0·4	580	5
—	0·5	560	4
6 per cent. Roller	—	490	2
6	0·1 added separately	530	3
6	0·1 dried with milk	540	4
6	0·2 added separately	540	4
6	0·2 dried with milk	550	4
6	0·3 added separately	560	4
6	0·3 dried with milk	550	4
6 .. .. Spray	0·3 dried with milk	550	4
6 .. .. Roller	0·4 added separately	540	4
6	0·4 dried with milk	550	4
6	0·5 added separately	530	3
6	0·5 dried with milk	550	4

TABLE 5

THE EFFECT OF ADDING HYDROGENATED PEANUT OIL WITH THE MILK POWDER

Skim milk powder	*Hydrogenated peanut oil Per cent.*	*Loaf volume c.c.*	*Texture*
—	—	550	3
—	0·1 added separately	560	4
—	0·2	570	5
—	0·3	590	5
—	0·5	580	5
6 per cent. Roller	—	490	2
6	0·1 added separately	530	3
6	0·1 dried with milk	540	4
6	0·2 added separately	550	4
6	0·2 dried with milk	560	4
6	0·3 added separately	570	5
6	0·3 dried with milk	560	4
6	0·5 added separately	540	3
6	0·5 dried with milk	560	4

The effect on bread structure and loaf volume of skim milk solids containing hydrogenated stearin and potassium bromate.

general appearance and flavour resembled the water loaves and was in no way comparable to the sweeter type of bread produced in the U.S.A.

When other dairy factories attempted to produce this modified skim milk powder containing G.M.S. and potassium bromate, difficulty was experienced with the roller drying. The powder curled up against the doctor knife, and damp areas appeared on the rollers. Increasing the steam pressure, reducing the gap, and reducing the feed rate improved the drying only slightly. Spray drying presented no difficulty.

Arrangements were made with a dairy factory to roller dry a number of small batches of skim milk containing G.M.S. and other additives. Ordinary unconcentrated skim milk dried satisfactorily under a fairly wide range of roller settings. Steam pressure was varied from the normal 85 p.s.i. down to 60 p.s.i. and the working gap between the rollers was reduced from the normal 60/1000 in. to 15/1000 in. Neither of these alterations unduly affected the drying of ordinary skim milk, apart from variations in output.

When 5 per cent. milk solids weight of G.M.S. was added, the skim milk would not dry well with any of the steam pressures or roller gaps used. There was a slight improvement with a reduced gap. Potassium bromate did not appear to affect the drying in any way. The addition of 5 per cent. G.M.S. to skim milk increased the rate at which it passed over the rollers by approximately 30 per cent. Neither the addition of 10 per cent. milk solids weight of corn starch nor 1 per cent. soya bean lecithin improved the drying of skim milk containing G.M.S. nor did the use of concentrated skim milk (S.G. 1·10) instead of unconcentrated milk overcome the drying difficulties. Mixtures were then prepared in which part of the G.M.S. was replaced by hydrogenated stearin, the total addition being maintained at 5 per cent. The milk dried satisfactorily when the ratio of hydrogenated stearin to G.M.S. was 3 to 1 or higher. With equal parts of G.M.S. and hydrogenated stearin the skim milk could be dried, but with difficulty.

Several dairy factories which had difficulty in drying the 5 per cent. G.M.S. product have successfully dried the 1 per cent. of G.M.S. 4 per cent. hydrogenated stearin product. Commercial baking trials using 3 per cent. to 6 per cent. of this modified skim milk powder have given most satisfactory results. The loaves obtained have been very similar to those made from powder containing 5 per cent. of G.M.S.

Method of Manufacture

The method of manufacture of this modified skim milk powder is summarised in the following instructions:

1. For every 100 gallons of skim milk 4 lb. of fully hydrogenated stearin, 1 lb. glyceryl monostearate (or 5 lb. of a commercial blend of the two) and ½ to 1 gallon of water are mixed together. The mixture is heated with a steam hose until the temperature approaches boiling point and the emulsion agitated until the temperature drops to about 120°F. The emulsion should be quite stable at temperatures below 120°F.

2. The skim milk is preheated to 185° to 190°F. for 30 minutes.

3. If concentrator is available the milk is concentrated to one-half or one-third. This step is not essential: unconcentrated skim milk is quite satisfactory.

4. 9·5 grams of potassium bromate are dissolved in approximately ½ pint of water.

5. To 100 gallons of the preheated milk, or its equivalent in concentrate, all the stearin emulsion and the potassium bromate solution are added while the milk is still hot. The milk is thoroughly agitated to ensure even dispersion of the ingredients. If concentrated skim milk is used, the stearin emulsion must be added *after* concentration.

Roller and Spray Drying

It may be found necessary to reduce the normal gap between the rollers and to raise the steam pressure. A gap of 25/1000 in. is suggested, but this will vary with different rollers. During drying it is essential to keep scorching to a minimum as a dark powder will affect the colour of the bread adversely.

If a spray drier is used a slightly better product can be made by using 5 lb. of glyceryl monostearate per 100 gallons of original skim milk instead of 4 lb. hydrogenated stearin plus 1 lb. glyceryl monostearate as in step 1. This particular form of the product can be dried only by the spray process and difficulties will be encountered if roller drying is attempted.

This powder has approximately the same keeping quality as ordinary dried skim milk and can be packaged in the same moisture-proof containers.

Appendix.—In test bakes, the following basic formula was used:

Flour	300 g.
Salt	6 g.
Compressed yeast ..	6 g.
Improver*	1·5 g.
Water	Variable

* The improver consisted of a base of malt flour containing 8 per cent. ammonium chloride and 0·2 per cent. potassium bromate.

The yeast was stirred into 50 c.c. of water to give a homogeneous suspension. A further 50 c.c. of water was used to dissolve the salt and improver. Any other dry ingredients were thoroughly mixed into the flour before any liquor was added. The yeast suspension was stirred into the flour, followed by the salt-improver solution. Sufficient water was added to bring the dough to the correct consistency. The dough was mixed for two minutes at slow speed in a laboratory model Hobart mixer. The water temperature was adjusted to give a final dough temperature of 26·6°C. When mixed, the dough was placed in a metal trough in a proving cabinet maintained at 26·6°C. and 95 per cent. relative humidity. After 150 minutes the dough was punched to expel the gas. One hundred and ninety-five minutes after mixing, three 155 g. dough pieces were scaled off. Each dough piece was rounded eight times by hand, passed through a sheeting roll twice and square moulded by hand. The moulded dough pieces were then placed in the baking tins for final proving. This final proving was allowed to continue until the dough pieces had risen to a fixed height. The loaves were baked in a rotating hearth oven for 20 minutes at 235°C.

The mean volume of three replicate loaves as measured by displacement of rape seed was accepted as the main guide to baking quality. A maximum of five marks was also given for texture.

Acknowledgments

The generous provision of accommodation from already overcrowded laboratory space at the Bread Research Institute in Sydney is gratefully acknowledged. Even more important in these investigations was the advice and keen interest of Mr. E. E. Bond, Director of the Institute. The assistance of Mr. S. H. Blythman in carrying out baking tests is gratefully acknowledged, as well as help received from other members of the Institute staff. In commercial drying experiments assistance was given by British United Dairies (in particular Mr. A. K. Klingender), the Korumburra Co-operative Dairy Co., and the Producers Distributing Society. Our thanks are also due to the many bread manufacturers who co-operated in many commercial baking tests.

(*Concluded at foot of next column*)

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A Text-book on Glycerol

GLYCEROL, or glycerin, is a chemical about which most people think they know all there is to know, until they require some special information about it and are unable to find it readily in the literature. The American Chemical Society has now collected most of this information in a recently published monograph* of some 460 pages dealing with its history and economics, natural sources, methods of production, refining, analysis, physical properties, chemical properties, physiological action, and uses.

It is refreshing to read in the preface to this volume that the dividing line between pure and applied science is so fast becoming nebulous that the American Chemical Society has combined its two editorial boards, and issues one volume on a particular subject for all purposes and for all users.

It is also pleasant to see that Great Britain is given first place in an American volume as one of the major world producers of glycerol, although this production is now only about one-third of that of the United States. In spite of its large production, the United States is still an importing country.

Complete descriptions are given of the preparation of glycerol, the underlying principles of which have changed very little, although the operational procedure has altered considerably in recent years. In view of the difficulties liable to be encountered with emulsions in the production of glycerol, these improved techniques would repay study by any manufacturer who has to cope with similar problems. This section and the chapter dealing with the physical properties of glycerol are probably the most valuable and satisfying portions of the volume.

Various standard requirements, both American and British, are quoted at length, together with full information concerning chemical and physical methods of analysis. The study of a short chapter devoted to the physiological effects of glycerol indicates that the risks attaching to its use are so small as to be insignificant. The least satisfying chapter is the one dealing with the uses of glycerol and, in this connexion, it is to be regretted that the excellent article on "Glycerin and its Substitutes in Industry" by W. F. Darke and E. Lewis (*Chem. and Ind.*, 1928, VI, pp. 1073-1092) appears to have been completely overlooked.

While the bibliography at the end of each chapter is large, few references are found to the work of British authors, even those given to Prof. Hilditch being taken from American sources.

After a careful perusal of this otherwise comprehensive volume it is amazing to find that a substance of which the annual world production is some 500,000,000 lb. is still derived almost entirely from natural oils and fats and that neither synthetic processes nor fermentation methods have yet ventured into serious competition.
—T. McL.

* *Glycerol*. A.C.S. Monograph No. 117, edited by Carl S. Miner and N. N. Dalton. Pp. 460+xiv. Reinhold Publishing Corporation and Chapman and Hall. Price 96s. net.

Antibiotic Infusions into Fresh Meat

EXPLORATION of the possibility of processing fresh meat by carcass infusion at slaughter, in order to improve and standardise quality, has led to experiments with infusion of antibiotics. It was hoped that such treatment might control deep spoilage in the absence of immediate chilling and thus afford an opportunity for improvement in tenderness, juciness, and flavour.

After preliminary investigation had indicated that organisms residing in the lymph nodes had a close relationship to deep spoilage, aureomycin was selected to determine whether its infusion could arrest spoilage. After checking against non-infused controls, it was found that not only did the antibiotic reduce bacterial population in the lymph nodes of beef rounds held at 3°C. for 48 hours, but it also kept the meat sound when the rounds were held at 75° to 85°F. for 76 hours.

A majority of the non-infused controls soured when held 48 to 72 hours without refrigeration. In these experiments the rounds were excised hot from conventionally dressed carcasses and those infused were pumped with saline containing aureomycin so as to put approximately 2 p.p.m. of the antibiotic into the meat.

Infusion of whole animals was carried out on seven lower grade cattle ranging between 700 and 1,200 lb. The animals were stunned, the carotid arteries exposed, the jugular veins severed and one carotid artery was cannulated, using a tube attached to a pickle pump. It was possible to infuse the whole animal in five to 15 minutes. After infusion, the animals were dressed in the usual manner.

One side was immediately chilled whereas the other was allowed to stay at room temperature for 48 hours prior to chilling. The sides were studied for bacterial populations and aureomycin residues in different tissue and the meat was tested for tenderness, moisture, and total nitrogen.

Very few organisms were present, even in the sides where refrigeration was delayed. The greatest numbers were present in the sides held at room temperature for 48 hours, but none spoiled. The counts in these decreased markedly when refrigerated.

In all seven animals as with the rounds, no flavour differences were noted which could be attributed to infusion with aureomycin. The infused beef appeared to be somewhat more moist, possibly owing to the flushing of the coagulable blood and its replacement with a clear liquid. The nitrogen moisture ratio was slightly lower for the infused meat. To determine whether these difficulties might be overcome, the concentration of the antibiotic was increased threefold and the volume of infusate was decreased to one-third. This prevented excessive moisture on the cut surface and apparently sufficient antibiotic penetrated the meat.

No adverse colour or paleness resulted from infusion of any animal, but there was an unexpected colour improvement in the side which was kept at room temperature. It had not been expected and was observed in the last three cases.

The loin steaks from the refrigerated sides were markedly less tender than those from the other sides. In fact, the steaks from the sides kept at room temperature for 48 hours and then chilled out were as tender at five days *post-mortem* as the others were at two weeks *post-mortem*.

The eating quality of the infused meat was satisfactory, and indistinguishable from that of normal meat. All the meat in this study, amounting approximately to 6,000 lb., was consumed by people concerned with the investigations. No adverse report was received which in any way was attributable to infusion or to the antibiotic.

Further tests showed that the aureomycin disappeared from both rounds and carcasses by the end of five days in the case of meat which was chilled after a delay. The antibiotic disappeared more slowly in the case of meat which was chilled immediately after infusion.

Processing meat by infusion before dressing at slaughter presents some packinghouse problems. There is also the problem of meat inspection. Nothing was encountered in the studies to indicate that these are insurmountable.

Abstract of a paper "Observations on Fresh Meat Processed by the Infusion of Antibiotics," by H. H. Weiser, H. S. Goldberg, V. R. Cahill, L. E. Kunkle, and F. E. Deatherage, presented at the annual meeting of the Institute of Food Technologists in Boston, June, 1953.

The Cider Factory

THE fault of verbiage oft-times noticeable in technical books, is notably absent from a recent one* on the construction and equipment of a cider factory. It does not contain an unnecessary sentence, yet there is nothing omitted that the reader requires to know. A Technical Publication of the Rural Engineering Service of the French Ministry of Agriculture, it has been admirably translated by Dr. V. L. S. Charley, Miss Pamela M. Mumford, and Mr. E. J. Martin.

The book is divided into 18 chapters and contains 54 diagrams clearly showing the layout of the different sections of the factory, with details of the equipment required. We are taken step by step through the process, from the reception of the fruit, its milling, the keeving and racking of the juice, and refrigeration, to the handling of by-products, such as the drying of the pomace and the distillation of alcohol from lees from the keeving and racking process and from ciders of poor quality or from those which are surplus to requirements on account of a heavy crop.

It would be difficult to overestimate the value of this excellent book, not only for those contemplating cider making *ab initio*, but also for those already in production who are desirous of obtaining authentic and clear information on extensions or rearrangement of their existing layouts.

* *The Cider Factory. Plant and Layout.* Pp. 101 + xii, with 54 diagrams. Leonard Hill Limited. Price 20s. net.

Disinfestation of Ships' Holds

The expense and trouble involved in shutting down ships for fumigation against infestation prompted Mr. T. H. Clarke, Marine Superintendent of Chandris (England) Ltd., to seek advice concerning alternative methods. As a result of discussions with Mr. J. L. Hitchon, senior entomologist to Insecta Laboratories, who had been concerned in the carrying out of comprehensive field trials in Lagos last year as entomologist to the Insecticide and Fungicide Research Council, certain recommendations were made, culminating in a trial to determine whether a new method of fogging could be used to reduce or entirely eliminate the need for fumigation against infestation aboard grain ships.

ONCE the original conception had been worked out, Mr. Clarke and Mr. Hitchon proceeded to occupy themselves with problems of its application. The requirements demanded for any proposed fumigation equipment were:

1. It must be portable.
2. It must be capable of dealing with widely differing shapes of ships.
3. It must disseminate a light residual fog on all surfaces in a short time, without the necessity for the intervention of skilled operators.

As these requirements had been satisfactorily met by the use of Microsol mechanical fog generators in one form or another in other industries, notably milling, grain storage, and food preparation, it was thought probable that such types of generator would be suitable for the present purpose.

Equipment and Insecticide Used

From the various models available, Model 202, electrically driven, was considered suitable to deal with the various sizes of ships' holds to be treated. The doubt as to whether the smaller particle size (60 Mμ) of the "fog" would have sufficient velocity to reach high up to the underside of 'tween-deck holds from the floors of the main holds, a distance of between 40 and 45 feet, was dispelled after tests were made to evaluate the closed space output and throw characteristics, using Shell Risella 17 oil as the base material. The effect of using this heavy material was to slow down the throughput and sustain the particles intact for long periods, whereby the recirculatory and turbulent effect of the Microsol equipment could be used to the best advantage.

In order that the treatment would remain effective for some period between applications, the employment of an insecticide with special properties was necessary; in this connexion, the advice of Mr. J. M. Holborn of the Cooper Technical Bureau was sought. It was eventually decided that the best material to use would be Pybuthrin 44, a non-toxic and non-tainting insecticide which has the additional advantage of activating the insects hiding in holes or crevices. In addition, it has a residual life, especially when used in dark locations; this life can be renewed easily with the Microsol frequent light fogging technique which it was decided to adopt for this particular trial.

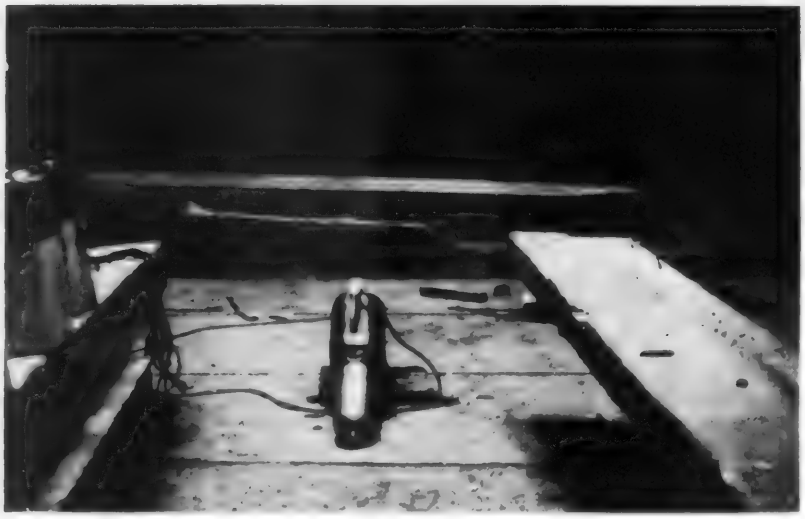
Selection of Ship

For the trials, it was necessary to select a ship which had discharged its grain cargo and was in ballast or in dry dock so that the whole test could be carried out in the presence of the ship's officers and the experiment repeated if necessary. Accordingly, arrangements were made by Chandris (England) Ltd. to carry out trials aboard the S.S. *Ivor Jenny*, a vessel of some 9,700 tons, which had recently discharged a cargo of grain. Arrangements were also made for Mr. J. D. Norris, the local representative of the Ministry of Agriculture and Fisheries, Infestation Division, to attend and make any further tests that might be necessary.

As it was necessary for the trials to be carried out with the support of the Canadian Authorities, the ships concerned coming under docking facilities and infestation control in Canadian ports, it was arranged that Mr. Hitchon hold a watching brief and forward reports on the trials.

At a preliminary meeting on the day prior to the trials, a full discussion was held at which were present: Mr. J. H. Clarke (Marine Superintendent, Chandris (Eng-

The only items of equipment used during the trial were the three Model 202 Microsol mechanical generators.



One of the Microsol units in position in the No. 2 hold.

land) Ltd.); Mr. J. D. Norris (Area Inspector, Ministry of Agriculture and Fisheries); Mr. J. L. Hitchon (Insecta Laboratories Ltd.); Mr. J. M. Holborn (Cooper Technical Bureau); Mr. J. L. Procter (Cooper, McDougall and Robertson); Mr. E. Bennett (Leonard Hill Ltd.); Mr. W. Simpson (South American representative of Cooper, McDougall and Robertson); and Mr. J. F. Clancy and Mr. K. W. Hole (directors of Microsol Industries Ltd.).

During this meeting details of the technique of application were given and it was agreed that on the following day work on the most difficult application of all, that of fogging No. 2 hold, which has a total capacity, including shelter deck, of 140,000 cu. ft., should be carried out, the contention being that if this were successful, then the other holds would be comparatively simple to treat.

Trial Procedure

For the purpose of the trial, three Model 202 mechanical fog generators with additional lengths of lead were used. The insecticide was Pybuthrin 44. While arrangements were being finalised, all the grain holds were surveyed and it was found that there was very little infestation, a tribute to the conditions of the ship since leaving a Canadian port loaded with grain some 30 days previously. It was also reported that there had been no time for cleaning the ship and that no cleaning down could be carried out in No. 2 hold before the trial. For the purposes of this trial only the lower hold was regarded as treated. The shelter deck would, in practice, require separate treatment.

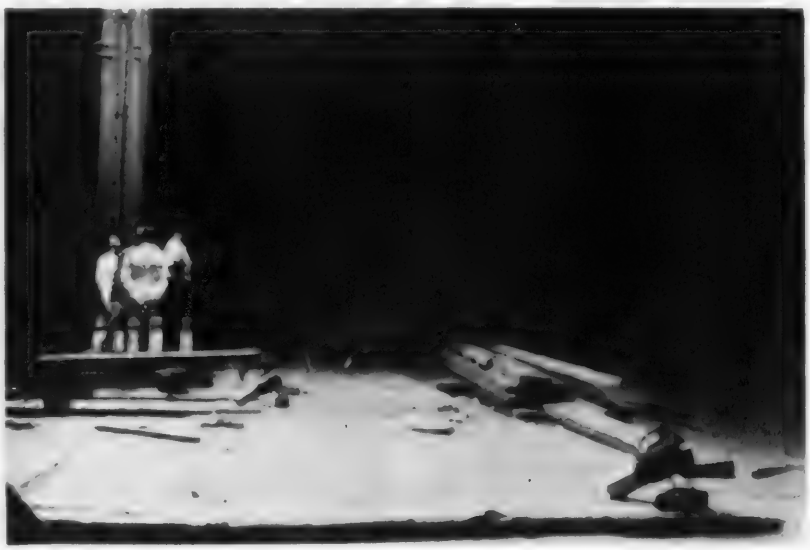
While the equipment for the trials was being set up, a preliminary demonstration with a Model 202 was given in the crew and officers' quarters, galleys, and stores, during which a large number of pests were killed in a total running time of six minutes, the overall time including connecting, disconnecting, and filling the generator being 15 minutes. The insecticide used was Pybuthrin 33, which is based on odourless kerosene.

Meanwhile in No. 2 hold the entomologists made an inspection and Mr. Norris, accompanied by his assistant Mr. Rhynehart, set out Petri dishes containing grain weevils, while Mr. Holborn placed filter papers at strategic points in the hold for subsequent determination of insecticide residues.

Rate of Application of Spray

Mr. Holborn stated that the recommended rate of application of Pybuthrin 44 as a residual spray was normally one gallon to 2,000 sq. ft. Therefore 10 gallons of insecticide should be applied in hold 2, assuming that a proportion of the insecticide would reach the shelter deck. Since it was understood that two further treatments were to be carried out while the ship was in ballast at sea, it was finally agreed that three gallons of Pybuthrin 44 should be applied each time, *i.e.* a total of nine gallons for approximately 20,000 sq. ft. (94,000 cu. ft.), and the former amount was used in the present trial.

At first sight, it did not seem possible that these three small machines, each weighing 12 lb., would in any way be capable of fogging so large a space without being moved about and carried on ladders up the sides of the hold. The three machines were started, arranged longitudinally along the starboard side, pointing into the fore and aft corners of the hold and abeam respectively. At the



The test in progress.

end of five minutes, the starboard half of the hold was filled with a thick, penetrating fog which rose effectively from the three units. This continued until the hold was completely filled with the insecticide, and the deposit started to form on various prepared surfaces, such as glass plates, and in the Petri dishes where grain weevils had been placed. By climbing the limber boards it was possible to examine the density of the fog at the top of the hold, and at this point it became impossible to see any difference in density between the top and the bottom. Close examination by torch beam revealed that high turbulence and therefore velocity had been imparted to the fog, and that the air recirculation and movement were sufficient to give impact velocity to the billions of droplets released into the air every minute.

Length of Fogging Operations

The machines each hold 3¼ Imperial pints, and it was therefore necessary to top up with Pybuthrin 44—easily accomplished without stopping the machines. Since masks were worn as a convenience and to avoid breathing in oil-laden air, those present stayed in the hold for 23 minutes, the time taken for the three machines to be discharged.

Refilling and replacing the machines took five minutes, and the tests were then repeated on the port side. Before starting them, however, one machine was used for fogging the bilges. The boards were kept in positions except those at either end and the machine, used as a hand gun, was directed through the large holes in the supporting ribs in such a way that penetration was observed to the middle position. The second half of the hold was then fogged, this time taking 21 minutes.

Results of Trial

An examination of the weevils in all the Petri dishes showed them all to be moribund or dead, and these were taken away for observation and the preparation of a report. The deposit on the test papers is also being reported upon.

The *Ivor Jenny* is proceeding to Hamburg, thence to Japan, and from Tokio it will be possible to carry out the technique while in passage to a Canadian port for loading with grain.

The following conclusions were arrived at as a result of the *Ivor Jenny* trials:

1. The frequent light fogging technique using Pybuthrin 44 is feasible.

2. The carrying out of the normal routine hygiene cleaning prior to spraying will greatly assist the effectiveness of subsequent hold spraying by Microsol units.

3. Ships' personnel need no training to use the equipment, but must be shown how to clean out the machines after use.

4. There is obviously a great saving in cost compared with gas fumigation methods in port. In conjunction with the latest rodent killing technique, the Microsol frequent light fogging technique is worth serious consideration by all shipping lines.

5. In the accommodation of a ship it is possible, using a frequent light fogging technique, to clear away and hold down infestation at the cost of a few shillings per week.

Materials Handling in Industry

IMPROVEMENTS in productivity in British industry depend upon a proper appreciation of materials handling and materials processing by management, foremen, and operators and of the importance of planning, organisation, and designing for production; on the employment of more qualified engineers on the production side; and upon production research being given the same status as product research.

These conclusions were reached in a paper on materials handling and processing read by Mr. L. Landon Goodman, B.Sc., A.M.I. Mech.E., A.M.I.E.E., at a recent meeting of the Royal Society of Arts.

Mr. Goodman said that all major industrial operations could be divided into two fields—materials handling and materials processing. Materials handling was defined as the technology embracing the movement and storage of everything within an industrial establishment, improved materials handling resulting in increased productivity and better utilisation of premises, upgrading of labour, reduction in accidents to personnel and products, and a consistent level of production.

Materials processing was described as the technology covering those operations through which material passed during the course of manufacture and which changed its form or composition. Blending of handling and processing led to uniform flow, improved process loading, reduction to a minimum of inter-process stores, elimination of bottlenecks, and better utilisation of labour, while the overall pulse of an organisation beats more quickly and more regularly.

Tracing the origins of mechanical handling, Mr. Goodman said that according to historical writers the Assyrians were acquainted with mechanical contrivances which were unknown today or which were looked upon as modern inventions. The pulley was used in Nineveh for raising water in the ninth century B.C.

In 1775, Arkwright was able to send raw cotton into a mill and bring out the thread, almost the whole work being done by machine, while in 1808 the Portsmouth pulley block factory, using special machinery designed by Brunell, had an output of 160,000 blocks a year produced by 10 unskilled men who did the work previously done by 110 men. During the years 1854-55, 10,000 shells a day passed through the Royal Laboratory, Woolwich, about which it was said, "the shells never touched the ground."

Mr. Goodman gave an account of the various handling devices used at the present time, which could, with advantage, be used in greater numbers. These devices included cranes of various kinds, lifts, roller chain and belt conveyors, elevators, and battery electric trucks. Incidentally, he pointed out that the first industrial battery electric truck was produced in 1906 in Pennsylvania.

Dr. L. A. Jordan (*left*) **receiving the Society's Medal for 1953 from the President, Mr. Francis Curtis. Afterwards Dr. Jordan gave the Medallist's address, which he called "Speaking of Science." Watching the presentation are Dr. L. H. Lampitt, hon. foreign secretary of the Society** (*left*)**, and Mr. J. M. Leonard, hon. treasurer.**

S.C.I. at Nottingham

REFERENCE was made to the committee established during the year under the chairmanship of Sir Eric Rideal to consider the structure of the Society from the point of view of present-day needs and future development and expansion at the business meeting held during the recent annual general meeting of the Society of Chemical Industry at Nottingham. This matter was also touched upon in two speeches by Mr. Francis Curtis, the President, first at the luncheon provided by the Nottingham section and again at the annual dinner. Mr. Curtis expressed confidence in the continued expansion of the Society so long as it continued to adapt itself to the developing and widening interests of industrial chemists. In his view, the chemist had a still greater role to play in industry, not only in production and research, but also in management and advertising.

For his Presidential Address, Mr. Curtis chose the subject of "Science as Culture" and said that there had been complaints that scientific education paid too little attention to the humanities. In the last 25 years, however, great progress had been made in altering this in nearly all the great institutions of higher learning. Students of the liberal arts, however, still received too little instruction in the sciences, although science and the conflict of political ideologies were the most potent forces in the modern world.

The presentation of the Society's Medal for 1953 to Dr. L. A. Jordan was followed by the Medallist's address entitled "Speaking of Science."

At the conclusion of the annual dinner came the formal investiture by the President of his successor, Sir William Ogg, with the presidential chain and insignia.

In addition to the many social events and factory visits, a number of scientific papers were read during the course of the meeting.

Dr. W. A. Sexton of I.C.I., discussed some relationships between chemical constitution and biological activity, Prof. R. L. Wain read a paper on "Plant Growth-regulating Substances," and Prof. A. C. Frazer on "The Biochemistry of Phospholipids."

An American member of the Society, Dr. Foster Dee Snell, read a paper on "Detergency as Applied to Radiological Decontamination." Papers were also read by Dr. S. Coffey on "Some Chemical Problems arising in the study of Anthroquinone Dyes," Dr. G. M. Dyson on "Advances in the Mechanical Documentation of Chemistry," Dr. D. W. Hill on "Inter-relation of Chemical Science and the Textile Industry," and Prof. F. E. King on "The Chemistry of Wood extractives."

Tin Research

AMONG the research projects described in the 1952 report of the Tin Research Institute is the production of a new bearing metal based on an alloy of aluminium carrying up to 30 per cent. of tin. The composition of the alloy can be varied to give a wide enough range of hardness to meet all the requirements of bearing in industry, while the fatigue strength of the alloy at operating temperatures is much greater than that of babbitts. Many tests of the alloys have been made on the Underwood bearing testing machines; the frictional qualities are satisfactory and the bearings appear to combine high fatigue strength with suitability for use on soft steel shafts.

The problem of binding these relatively soft alloys to a rigid steel backing is not yet solved on a basis suitable for industrial use, but processes have been devised which have enabled trials to be organised.

In the field of tinplate, the development of methods of assessing quality have been continued, with particular reference to procedures capable of measuring quickly and accurately the thickness of the alloy layer in electrolytic tinplate.

Progress has been made in methods of appraising the corrosion behaviour of tinplate. Laboratory scale plant has been devised for producing electro-tinplate of reasonably standard quality which has been of material assistance in the work of corrosion testing.

The manufacture of organotin compounds, hitherto only available in the United States, has been started in England and is now being contemplated by some chemical manufacturers on the Continent. New methods of preparation have recently been devised by the Institute's research workers in Holland, and it is hoped that these processes will enable organotin compounds to be manufactured more cheaply in the future.

During the year, a considerable amount of information has been gathered on the fungicidal properties of another group of organotin compounds, and economical methods of manufacture are now being investigated.

Lactic Acid Bacteria in the Meat Industry

It was in 1873 that Lord Lister described the occurrence of an organism in sour milk which he named *Bacterium lactis*. Thus was born the recognition of a group of micro-organisms popularly referred to as the "lactic acid bacteria," a group which is of considerable economic importance in many of the food industries.

THREE of the lactic acid bacteria of main significance in the meat industry are the *Lactobacteriaceae*, namely *Lactobacillus*, *Leuconostoc*, and *Streptococcus*. Since no such classification was in existence at the time of Lister's original description of the milk souring organism, many years elapsed until it was renamed *Streptococcus lactis*, a name which is more familiar today.

Like so many other foods, meat and meat products supply adequate nutrients for the growth of the lactic acid bacteria. In the handling and curing of meats it is extremely difficult to prevent accidental contamination with these bacteria. They represent one of the most common groups of micro-organisms encountered in meat foods that have not been given a severe heat process. Because of their omnipresence, as well as their actual and potential economic importance, it is necessary to become thoroughly familiar with the characteristics of this group of bacteria and to relate these characteristics with the conditions created in the routine handling and processing of meats in the packing plant.

Characteristics of the Bacteria

Different species of the lactic acid bacteria grow over a considerably wide temperature range. Some species are able to grow reasonably well at temperatures slightly above freezing point, while others are able to grow at temperatures up to 125°F. Not many species will grow below 40°F. or above 115°F.

A certain number of the lactic acid bacteria are tolerant to salt and are able to grow in concentrations up to 18 per cent. However, as others are very sensitive to salt, it can be incorporated in media at different concentrations for the purpose of selectively culturing certain species from natural materials. The salt tolerant lactic acid bacteria are especially important in the manufacture of sauerkraut, and certain types of cucumber pickles. They are also of importance in the dairy as well as the meat industries.

All lactic acid bacteria obtain their energy for growth primarily by fermentative mechanisms; the most common substances fermented are the various sugars, higher alcohols, *e.g.* glycerol, mannitol, and sorbitol, and a few of the organic acids. Virtually all of them are able to ferment dextrose, the majority ferment sucrose, and depending upon their source, a number of them ferment lactose. A few species elaborate extra-cellular enzymes that digest starch, dextrin, glycogen, or inulin, and thus make them available as sources of energy.

Some members of both the homofermentative and the heterofermentative lactic acid bacteria produce traces of acetoin from sugar fermentation. This substance contributes to the characteristic nutty flavour and aroma of butter and fermented milk drinks. Advantage is taken of these acetoin-producing bacteria to improve the flavour of some dairy products.

Fermentation and Oxidation

The lactic acid bacteria characteristically obtain energy for growth by fermentation rather than oxidation. They are consequently able to grow either anaerobically or aerobically—little quantitative difference in the amount of growth results under the two environmental conditions. This does not mean, however, that these bacteria are incapable of oxidising certain substances under aerobic conditions. Various members of this group are able to oxidise such substances as lactic, pyruvic, butyric, alpha-ketobutyric, and valeric acids as well as a number of the alcohols, including glycerol. Certain unidentified substances in meat juices are also oxidised by some of these bacteria. Apparently the majority or all of the energy released in these oxidative systems is lost, and is not made available to the organism for growth.

So far as is known, none of the lactic acid bacteria has extracellular lipolytic enzymes and they are therefore unable to hydrolyse fats rapidly. Moreover, oxidative rancidity of fatty foods is not enhanced by these organisms. In fact, owing to their ability to create effective reducing conditions in their environment, some of these micro-organisms might actually retard the onset of oxidative rancidity in fats.

None of the well-defined species in this group is putrefactive. The odours and flavours produced by them when growing in foods are usually not offensive, but are inclined to have a clean, sour taste, and, if anything, a pleasant aroma. None of the *Lactobacillus* or *Leuconostoc* species is capable of digesting proteins. Two *Streptococcus* species, however, have proteolytic properties, and the resulting peptones released into the medium or food in which they have grown may impart a bitter flavour to them.

Only a few amino acids appear to be attacked by the lactic acid bacteria. Granted, however, they are able to synthesise certain of the amino acids by a reversible transamination of the respective keto acids from glutamic. Arginine is attacked by many species with the production of ornithine, carbon dioxide, and ammonia. This enzyme system, however, is distinct from the enzyme arginase, in animal tissues. A few species also decarboxylate tyrosine to tyramine and carbon dioxide. No lactic acid bacteria are able to reduce nitrates to nitrites.

Abstract of a paper by C. F. Niven, Jr., at the Fourth Research Conference of the American Meat Institute.

Growth in Meats

Lactic acid bacteria are peculiarly adapted to growth in both fresh and cured meats. Accidental contamination of meats invariably leads to the presence of these organisms, and they may constitute a significant proportion of the flora. As fresh meats are aged, the effects of the lactic acid bacteria are overshadowed by other types of micro-organisms and their presence is of little consequence. On the other hand, cured meats provide a more selective type of medium in which the curing salts inhibit the growth of a large part of the bacterial flora found in the uncured meats. Many species of the lactic acid bacteria are able to grow in this new environment, however, especially when an adequate energy source in the form of sugar is provided in the cure.

The question is often asked as to whether these bacteria play any beneficial role in the curing of such meats as hams. In all likelihood, no bacteria are necessary in the streamlined practices now generally employed for curing most meat products. That these and other bacteria might play a role in the development of characteristic flavours in certain types of long-cured hams and other meats cannot be denied.

Cured and Fermented Sausages

There exists in our diet a large class of cured and fermented sausages and meat products of which a great many varieties are available on the market. As in the cheese industry, the lactic acid bacteria are definitely essential in their manufacture. The desirable tanginess and acid flavour noted in these meat foods are attributed to these bacteria. Also the strong reducing conditions created in the meats by the bacteria no doubt are important in the production and maintenance of the rich red colour noted in most of these meat foods. Many of the fermented sausages receive a long smoke at a relatively low temperature only.

In contrast with the mixed cure customarily employed for the more common sausages and hams, a straight nitrate cure is usually used in the manufacture of the fermented sausages. Therefore, dependence upon a nitrate reducing micro-organism is necessary for proper colour fixation. If insufficient nitrates are reduced, improper colour will result; if too much nitrite accumulates, the desired growth and fermentation by the lactic acid bacteria may be impaired. It is no wonder, then, that failures occur occasionally in their manufacture. Chance contamination of the correct proportions of the lactic acid bacteria, as well as of the nitrate-reducing bacteria, is relied upon.

It may be wondered why pure culture starters are not employed as they are in the cheese industry. Actually, this has been proposed for a number of years and a patent has been issued for such a process. Perhaps more research is needed to investigate the possible use of mixed culture starters that would also include nitrate reducing micro-organisms.

Apart from their many desirable features, the lactic acid bacteria are commonly encountered as spoilage organisms in the meat industry. For example, such products as bologna and meat loaves will sour if given an insufficient heat processing and then subsequently held at temperatures high enough to permit growth of the surviving bacteria. At this time it would be redundant to discuss also the different types of discolorations of cured meats produced by certain hydrogen peroxide-producing *Lactobacillus* and *Leuconostoc* species.

Vinegar Pickled Meat Products

A spoilage problem commonly observed is the development of turbidity in vinegar pickled meat products. This condition is very apt to occur when attempts are made to prepare such specialities as vinegar pickled sausages. If insufficient vinegar is added the pickle tends to become cloudy and have a heavy sediment on the bottom of the container. Occasionally, the pickle becomes opalescent and ropy. This unsightly condition results from the growth of acid tolerant lactobacilli in the pickle.

Growth of the contaminating lactobacilli occurs after the sugar and other nutrients have leached out of the sausage and into the pickle. Experience has shown that a minimum of 3·6 per cent. acetic acid must remain in the pickle, after equilibrium with the sausages has been established, in order to assure freedom from turbidity development. This high concentration of vinegar tends to impair the palatable features of these specialities and thereby makes it very difficult to prepare a shelf item of this kind.

Pathogenicity of Lactic Acid Bacteria

In discussing the lactic acid bacteria, their human health significance should not be ignored. None of the spoilages of meat products discussed is caused by lactic acid bacteria that might endanger human health, but admittedly, these spoilages might indicate mishandling of the food at some stage before they are consumed. None of the *Lactobacillus* or *Leuconostoc* species is known to be pathogenic. A few *Streptococcus* species, especially *Streptococcus pyogenes*, are human pathogens but they appear to be unable to grow in or on cured meats. For this reason, and because they are very heat labile, meats rarely have been involved in the spread of disease by these micro-organisms as has been the case with some other foods.

Significance of the Enterococci

There is one group of streptococci, namely the enterococci, that may have some significance. This group, which includes *Streptococcus faecalis* and three other species, is receiving increasing attention by the public health authorities when they are found in foods. They are considered to be intestinal organisms, and some consider their presence in foods as being an index of pollution.

The enterococci are a hardy group of bacteria capable of growing in foods at a rapid rate over a rather wide temperature range. They commonly occur in certain types of cheese and other food in large numbers and are believed by some to contribute toward the desirable flavour of these foods. In spite of their ubiquity in some of our common foods, as well as in the intestine, there is some evidence to indicate that they may cause food poisoning.

Controlled human feeding tests with representatives of this group have thus far failed either to incriminate conclusively or free these organisms of any suspicion of being food poisoning micro-organisms. Because of their common occurrence, many food poisoning outbreaks have no doubt been blamed upon these organisms, and the real culprit escaped undetected.

Use as Starter Cultures

There is a considerable lack of knowledge as to the different types of lactic acid bacteria that are normally found in meats. More study of these micro-organisms is warranted, especially in the light of their possible useful applications. For example, a few streptococci and lactobacilli have been reported to synthesise powerful antibiotics. Perhaps they may never compete with penicillin or some of the other antibiotics in human therapy, but the possible employment of such bacteria in foods as starter cultures should stimulate our imagination as a possible means of controlling certain types of spoilage.

Potential Uses for Lactobacilli

The preservative qualities of the lactic acid produced by these bacteria have been employed for centuries in our foods, though unwittingly in most instances. The distilling industry makes use of a *Lactobacillus* to adjust the *p*H of the mash, and thus makes huge savings in this one phase of the industry. There may be places in the processing of by-products in the meat industry in which this principle of biological *p*H adjustment could be used to good advantage.

Individual strains of lactic acid bacteria are apt to impart different and characteristic flavours to foods. By proper selection of strains, new and different meat foods of good consumer appeal might be a possibility in the future.

The lactic acid bacteria are, indeed, an interesting group. Their actual and potential usefulness greatly overshadows their economic importance as spoilage micro-organisms.

Yeast Manufacture

It would be possible to live for a long time on bread and beer alone. Should any nutritionist criticise such a diet for its deficiency in protein and perhaps vitamins of the B complex, then a yeast supplement can supply these too. In fact, it could be claimed with good reason that yeast is the most important single ingredient of our diet, hence the importance of a book* devoted to its manufacture.

Yeast occupies a special place in the realms of pure science for, jointly with mammalian muscle, it has explained to us the whole complex process involved in the liberation of energy inside the living cell—one of the most remarkable advances in the field of biochemistry. It is surprising, therefore, that in a book devoted to yeast no mention is made of the chemical reactions involved in yeast glycolysis, of the all-important energy-rich phosphate bond, of the ubiquitous adenosine triphosphate, or of any of the intermediary metabolites. Indeed the author says "how the change (from sugar to alcohol) actually occurs is not known"—a statement somewhat at variance with all modern text-books of biochemistry.

As Mr. Walter so rightly remarks "perfection in the methods applied to yeast production will not be achieved until all the factors involved in the metabolism of the yeast cell are completely understood." It would then be expected that a discussion on the manufacture of yeast would start with a description of what is already known about these very factors, but the introductory chapter of this book is so deficient in this respect that the coenzyme functions of vitamin B_1 pyrophosphate are hidden behind the statement that "alcoholase can only act in co-operation with phosphate and an unknown substance that is diffusible and not destroyed by boiling."

A possible explanation of these deficiencies is that the book is written for the technician and not for the technologist, the man who wants to know how the manufacture is carried out but not why; in this respect it fulfils its purpose. Chemical journals often require that in papers offered for publication the experimental details must be sufficient to enable any competent operator to repeat the experiments. By this standard Mr. Walter's book passes with flying colours. It contains a most lucid and detailed description of each stage in the manufacture of yeast, from the preparation of the seed yeast right through to the final packaging, and even includes suggestions for the profitable disposal of the spent grains.

This new edition is some 50 pages longer than the first edition, published in 1940, mainly accounted for by a new brief chapter on "Process Improvements" and a long appendix on the "Manufacture of Malt Extract." The new chapter contains the complete specification of a patent taken out by the author in 1935, described as one of the most efficient methods of yeast manufacture yet introduced, and offered to readers for their free use. The improvement is directed towards the avoidance of losses due to alcohol production, which is also detrimental to the yeast itself, by cultivation in a minimum concentration of sugar together with unusually vigorous aeration produced by air jets, so that only reproduction and no fermentation occurs. The resultant yeast is more stable on storage and has superior dough-raising powers.

The appendix on malt extracts includes a detailed account of methods of preparation together with a description of the layout of the factory and its equipment.

It is disappointing to find no mention of the manufacture of yeast from waste materials such as sulphite liquors or plant juice residues, as the contribution offered to the world's food supplies by it could be so important.

For the technician, then, this book is most satisfactory, but if improvements in a process are to be achieved the practitioners of that process will require to know the why and wherefore as well as the know-how.—A. E. B.

* *The Manufacture of Compressed Yeast*. By F. G. Walter, A.A.C.I. 2nd Edition Revised. Pp. 317+x. Chapman and Hall. Price 37s. 6d.

A New Way of Making American Cheddar Cheese

Homer E. Walter, Arthur M. Sadler, James P. Malkames, Jr., and Clair D. Mitchell,
Division of Dairy Products Research, U.S.D.A.

A new, short-time method for making Cheddar cheese, developed on a pilot plant scale by the Bureau of Dairy Industry, requires only 2½ hours from the time the rennet is added to the milk until the curd is pressed, whereas present methods require 5½ to 6½ hours. Most of the hand labour required in present methods is eliminated, as are the operations of packing, cheddaring, and milling the curd. No attempt has been made to adapt either the method or the equipment to a commercial size operation, and minor changes in both may be necessary under commercial conditions. However, the method has been thoroughly tested on the pilot plant scale and is ready for trial by the industry.

BRIEFLY, the operations in the new method consist of the following: The milk is ripened and set at a temperature of 88°F., and the curd is cut and cooked to 100°F. in a conventional Cheddar cheese vat. The mixture of curd and whey is then pumped into a revolving, perforated drum where approximately half the whey is removed. The curd and remaining whey fall into a round cooking kettle, in which it is heated to a temperature of 115° to 120°F. and salted. The salted curd and whey is pumped into a new-style cheese hoop in a hooping tank containing whey that has been heated to a temperature of 115° to 120°F.

The body, texture, and flavour of cheese made by this method are equal or superior to those of high-grade cheese made by present methods. Usually the cheese is waxy and completely free of mechanical openings. A mild, pleasing flavour usually develops within three months when the cheese is cured at 55°F. Additional flavour develops during further curing at 50°F.

In developing the new method, 400 pounds of milk were used in each experiment, but at times as much as 1,200 pounds were used. The milk, from the Bureau's herd at Beltsville, was produced under grade A market milk regulations. It contained 3·5 to 4·5 per cent. of butterfat and was pasteurised either by the high-temperature short-time method at 160° to 161°F. for 20 seconds or by the holding method at 150° for six minutes.

Experimental Equipment

Several new pieces of equipment were used in the pilot plant operations.

1. *Separating drum.*—The perforated, revolving metal drum was 22 inches long and 8¾ inches in diameter. The perforations were $\frac{1}{16}$ inch in diameter and there were approximately 70 holes per square inch.

2. *Cooking kettle.*—A 90-gallon, stainless steel experimental Swiss-cheese kettle equipped with a mechanical stirrer was used as a cooking kettle. It was a jacketed-type kettle, to provide for heating the contents.

3. *Cheese hoop.* — The new-style cheese hoop was composed of three parts: a body, a tray-like bottom, and a follower. The body was 11 by 14 inches inside and 24 inches high. The bottom was 11¼ by 14¼ inches inside and one inch deep and was fastened to the body with two pins. The follower was 10¾ by 13¾ inches. All the pieces were made of stainless steel $\frac{1}{10}$ inch thick and were perforated with ¼ inch holes every 2½ inches on centre.

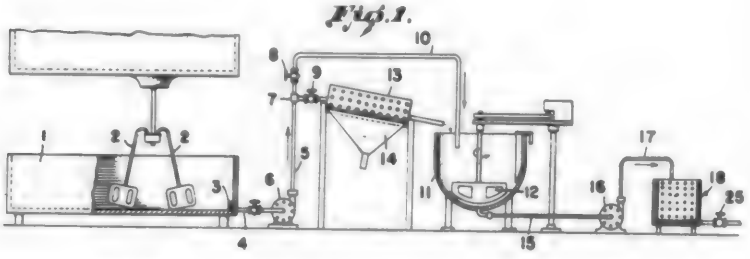
4. *Hooping tank.*—The hooping tank was approximately 16 by 19 by 29 inches inside, which allowed a space of two to three inches around the hoop. Two metal strips supported the hoop about three inches above the bottom of the tank. The tank was equipped with an overflow outlet near the top and a drain valve near the bottom.

5. *Pumps.* — Positive - action pumps were used to transfer the curd and whey from the vat to the drum and from the cooking kettle to the hoop.

Use of Two Starters

In making cheese by the new method, two starters are used. One is the conventional, commercial lactic starter and the other is a non-haemolytic strain

Fig. 1.



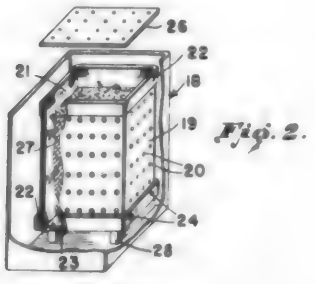


Fig. 2.

1. CHEDDAR VAT
2. AGITATOR
3. VAT SHEATHER
4. PIPE LINE
5. PIPE LINE
6. PUMP
7. TEE
8. VALVE
9. VALVE
10. PIPE LINE
11. COOKING KETTLE
12. STIRRER
13. SEPARATING DRUM
14. RECEPTACLE
15. PIPE LINE
16. PUMP
17. PIPE LINE
18. HOOPING TANK
19. HOOP
20. ¼ HOLES
21. CHEESECLOTH
22. OVERLAP OF CHEESECLOTH
23. BOTTOM
24. PINS
25. VALVE
26. FOLLOWER
27. CURD
28. SPACERS

Pilot plant equipment.

of *Streptococcus durans*, hereafter referred to as SD-A.

SD-A survives a cooking temperature of 115° to 120°F., or even 125°F. for a short time. It grows rapidly and produces acid in milk and cheese at temperatures of 85° to 115°F., but grows slowly at curing temperatures. It also grows well in whey and curd containing 4 per cent. of salt and in cheese containing 1·4 to 1·7 per cent. of salt.

The commercial lactic starter, on the other hand, does not survive cooking and pressing temperatures of 115° to 120°F. in combination with the amount of salt present. It produces little or no acid at temperatures above 105°F.

Therefore, both starters grow and produce acid during the ripening period and until the whey and curd are heated the second time. SD-A, however, continues to grow and produce acid during hooping, pressing, and the early stage of curing.

Propagation of Starters

The mother and bulk commercial lactic starters are propagated in the conventional manner and with the usual precautions.

SD-A mother starter is propagated in either sterile skim milk or reconstituted milk prepared from low-heat, spray dried non-fat milk solids known to be free of antibiotics or other inhibiting agents. It is transferred daily, incubated at 98°F. for 16 to 18 hours, and stored at 45° to 50°F. for six to eight hours until the next transfer or the inoculation of bulk starter. The milk may be sterilised in either a steam-pressure autoclave or a pressure cooker for 20 minutes at 15 pounds pressure. Pyrex brand glassware or metal containers should be used in the steriliser.

SD-A bulk starter is prepared in skim milk that has been heated in flowing steam for one to one and a half hours and cooled to 98°F. The milk is inoculated with mother starter at the rate of 1¼ ml. per pound and incubated at 98°F. for 16 to 18 hours. The resulting bulk starter should have a titratable acidity of 0·50 to 0·60 per cent. It does not "set up" as well as the commercial lactic starter, and it usually wheys off slightly.

Manufacturing Procedure

On the basis of the pilot plant experiments, the following manufacturing procedure is recommended.

1. *Pasteurising and cooling the milk.* — The high - temperature, short-time method of pasteurising is recommended. The cooler should be so adjusted that the milk is cooled only to the ripening and setting temperature of 88°F.

2. *Adding starters and ripening.*—The two starters are added to the milk at a temperature of 88°F. in a Cheddar-cheese vat. Usually 1·5 per cent. of the lactic starter and 0·75 per cent. of the SD-A starter are sufficient to develop the desired amount of acid during the making process so that the *p*H of the cheese when it is taken off the press will be from 5·1 to 5·3. If the *p*H is higher than 5·3, the quantity of SD-A starter should be increased in subsequent lots. If the *p*H is lower than 5·1, the quantity of SD-A should be decreased. The milk is ripened for one hour at 88°F., during which time the acidity of the milk should increase about 0·01 to 0·02 per cent.

3. *Adding rennet (setting).*—Rennet and colour (if used) are added one hour after the addition of starters. The temperature of the milk should be 88°F. Rennet (which has been diluted with water) is added at the rate of four ounces for each 1,000 pounds of milk, and stirred in thoroughly. The milk coagulates (sets) into a firm curd that is ready to cut 20 minutes after the rennet was added.

4. *Cutting the curd.*—The curd is cut into ¼ inch cubes. A finer cut increases the loss of fat in the whey, and the cheese may contain less than 50 per cent. of fat in the solids. Immediately after the curd is cut, it is stirred continuously with the agitator to prevent clumping. Extreme care should be taken to avoid breaking the curd particles.

5. *First cooking.*—Twenty minutes after cutting, the steam is turned on and the curd and whey are heated gradually from the setting temperature (88°F.) to 100°F. in 30 minutes. It is held at 100°F. for 10 minutes—at this time the agitator travel is shortened, and a vat strainer is inserted in the vat gate. About 10 per cent. of the whey is pumped directly from the vat into the cooking kettle, stirred, and reheated to 100°F. The vat strainer is removed, and stirring in the vat is continued.

6. *Screen - separating.* — The mixture of curd and remaining whey is pumped from the vat into the elevated end of the perforated, revolving drum. The pitch of the drum and the speed of rotation should be so adjusted that about half the whey is separated from the curd as it is tumbled through the drum. The partially drained curd falls directly into the cooking kettle containing the whey previously pumped from the vat, and it is stirred continuously and reheated to 100°F. The separated whey falls into the receptacle below the drum. This step in the procedure should be completed in about 10 minutes. The final volume of curd and whey in the cooking kettle should be about half that of the original milk.

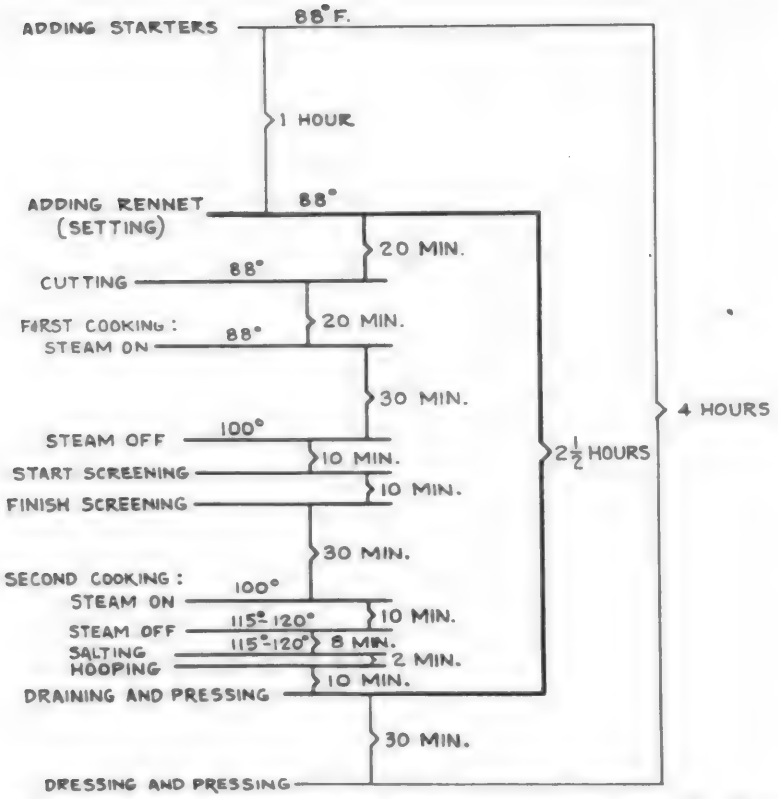
Part of the whey in the receptacle (equal to about 10 per cent. of the original milk) is saved for use in the hooping tank, and the rest may be either processed or discarded.

7. *Second cooking.*—The mixture of curd and whey in the cooking kettle is stirred and the temperature is held at 100°F. for 30 minutes. Then it is heated to a temperature of 115° to 120°F. in 10 minutes, and it is held at this temperature for eight to 10 minutes further to firm the curd and reduce its moisture content.

8. *Salting.*—Salt is added to the curd and whey in the cooking kettle at the rate of 4 per cent. of the weight of the contents of the kettle. This is sufficient to ensure from 1·4 to 1·7 per cent. of salt in the finished cheese. The salted mixture is stirred for two minutes before it is hooped.

9. *Hooping.*—The hoop body is lined with cheese cloth, with about two inches overlapping at both ends, and the hoop bottom is covered with cheese cloth. Then the hoop body is inserted into the bottom, fastened with the pins, and placed in the hooping tank.

The screen-separated whey that was saved for use during hooping



Time schedule for making American Cheddar cheese from pasteurised milk (2½ hour method).

is heated to a temperature of 115° to 120°F. and pumped into the hooping tank. Then the salted curd-and-whey mixture is pumped from the cooking kettle into the hoop. The mixture may be discharged either above or below the surface of the whey. In either case, however, the discharge outlet must be pointed upward so that the curd will fall by gravity through the whey and form a uniform layer in the hoop. If the outlet is pointed downward into the whey, air bubbles will be introduced into the curd which result in mechanical openings in the finished cheese. The curd settles quickly and forms a uniform block. The excess whey runs out through the overflow outlet near the top of the hooping tank. This whey contains about 4 per cent. of salt and therefore is not suitable for use as human food or animal feed.

10. *Pressing.* — As soon as pumping is completed, the bandage at the top of the hoop is folded carefully over the curd beneath the whey, the perforated metal follower is placed in the hoop, a 20 pound press-weight is placed on the follower. The whey is drained through the outlet valve at the bottom of the tank, and the cheese is pressed for 30 minutes. The press-weight and follower are removed and the cheese is dressed. The bandage is smoothed and pulled tight around the cheese to prevent wrinkles in the surface of the cheese. After the cheese is dressed, it is pressed for 16 to 20 hours. A pressure of 20 pounds per square foot is required to obtain satisfactory texture and to expel sufficient moisture. Too much pressure—usually more than 30 pounds—tends to seal the surface of the cheese, thus preventing sufficient drainage of the whey.

11. *Packaging.*—When the cheese has been pressed for 16 to 20 hours, it is removed from the press and prepared for packaging in the conventional manner. It may be either paraffined or wrapped in film. If the cheese is to be paraffined, it is placed in a drying room and turned once a day until the surface is dry; if wrapped in film, its surface must not be wet. Excessive leakage of moisture after wrapping results in a layer of free liquid between the film and cheese during curing. At packaging, the composition of the cheese is as follows: moisture, approximately 38·0 per cent.; fat, approximately 31·5 per cent.; and salt, 1·4 to 1·7 per cent.

12. *Curing.* — The cheese is cured under usual conditions of temperature and humidity. However, it ripens and develops flavour faster than cheese made by present methods. During the development of this method, cheese was cured continuously at 40°, 50°, and 55°F., and at 55°F. for two to four months and then at 50°F. for varied periods. Ripening was too slow at 40°F. and very little flavour developed when the cheese was cured for a year at this temperature. Excellent results were obtained when the cheese was cured at either 55°F. for three to four months or at 55°F. for two to four months and then at 50°F. for two to six months. The rate of body breakdown and flavour development was much faster at 55°F. than at 50°F. To avoid too much breakdown in the body, the cheese should not be cured at 55°F. for more than three or four months.

13. *Quality of cheese.* — The body of young cheese is firm and pliable. The texture usually is meaty. The cheese becomes mellow and smooth during curing, very few, if any, mechanical openings being formed. Cheese cured at 55°F. for about three months has a mild flavour that appeals to many consumers. A full flavour develops during further curing at either 55°F. or 50°F. Curing at 55°F. for more than three or four months may ruin the body of the cheese. However, the cheese can be cured at 55°F. for three to four months and then at 50°F. for six months or more without injuring the body.

IMPORTANT NOTICE

CORRESPONDENCE is still being sent to our old address. The new address of Leonard Hill Limited is:

Stratford House,
9, Eden Street,
London, N.W.1.

Food Poisoning

THE report* of the Medical Research Council for the year 1951-52 has just been published. In the section on bacterial food poisoning is given a brief but informative synopsis of the history of the subject. Due credit is given to Dack and his colleagues who in 1930 reported the discovery of a toxic substance formed by a common organism known as *Staphylococcus aureus*. Dack showed that the type of food poisoning caused by this organism was different from that caused by *Salmonella*, which produces a true infection; the organisms multiply in the gut and form their poison *in vivo*.

Staphylococci, on the other hand, multiply in the food beforehand, so that when it is eaten it is already toxic, and symptoms appear after only a very short incubation period. Even with this extra knowledge, at least half the outbreaks remained unexplained. Careful study of these revealed that the one factor common to them all was the presence in the food of an enormously large number of bacteria, belonging to types that are not ordinarily pathogenic to man.

Food Poisoning in Canteens

The report comments on the latest addition to our knowledge of another organism responsible for food poisoning. During the war, Dr. R. Knox at Leicester and Dr. J. T. Duncan at Winchester, who were both members of the Public Health Laboratory Service, isolated from meat dishes or gravy that had been cooked on the previous day an organism belonging to the group of anaerobic spore-bearers known as *Clostridium*.

The outbreaks of food poisoning that they observed were all associated with the consumption of food prepared in large quantities, as in school canteens. Several more of these outbreaks have occurred of recent years, and have been carefully investigated by Dr. Betty Hobbs of the Food Hygiene Laboratory of the Service at Colindale. The usual history is for the meat or gravy or stew to be boiled up in large saucepans, to be allowed to cool down overnight, and to be warmed up for the school dinner the following day. Symptoms of food poisoning come on about 12 hours later.

Bacteriologically, the food is often seething with anaerobic spore-bearing bacilli. Indeed, on one occasion when it was brought to the laboratory, it was actually bubbling with gas produced by fermentation. It would appear that, when the meat is brought to boiling, all organisms except those that have spored are killed, and all oxygen is driven off. The anaerobic spores then find themselves alone in an excellent nutrient medium, containing reducing substances such as glutathione, and therefore start multiplying as the meat slowly cools down. By the next day they are present in numbers sometimes approaching hundreds of millions per gram of food.

A Variant of *Cl. Welchii*, Type A

The joint investigations of Dr. Betty Hobbs at Colindale, of Prof. C. L. Oakley, then of the Wellcome Physiological Research Laboratories at Beckenham, and of Prof. J. C. Cruikshank of the London School of Hygiene and Tropical Medicine, have now identified this organism as a heat-resistant variant of *Cl. welchii* Type A. Whether the toxic substance it produces is contained in the bodies of the organisms themselves or is derived from the food as the result of bacterial enzyme action is still not known. There is no doubt, however, that *Cl. welchii* must now be added to the list of organisms that are capable of giving rise to bacterial food poisoning.

This discovery is of particular interest in view of the part played by certain other types of this organism in causing intestinal disease in animals, such as lamb dysentery, infectious enterotoxaemia, and pulpy kidney disease, although it is clear that the mechanism by which these diseases are produced is akin more to that concerned in the genesis of gas gangrene than to food poisoning in man. Botulism, it may be added, which is a form of food poisoning caused, like that due to *Cl. welchii*, by an anaerobic, heat-resistant spore-bearing organism, is rarely seen in this country.

Reference Laboratories

Tribute is paid in the report to the Public Health Laboratory Service, to whose work the large amount of new knowledge gained can be ascribed. The large-scale distribution of spray-dried egg by the Ministry of Food in 1942 formed the starting point of a fresh investigation into salmonella food poisoning that resulted in the discovery of a number of new types of this organism, and led to the establishment under Dr. Joan Taylor of a Salmonella Reference Laboratory which now serves most of the British Commonwealth.

Similarly, during the war a method was worked out in the Oxford laboratory for distinguishing between different types of staphylococci by making use of their susceptibility to lysis by a range of bacteriophages. This method has proved remarkably useful in "finger-printing" individual organisms and relating those found in the food and the patients to those found in persons engaged in the preparation of the food and responsible for contaminating it.

The Staphylococcus Reference Laboratory at Colindale, which was at first under Dr. V. D. Allison and is now under Dr. R. E. O. Williams, acts informally as the central typing laboratory for the whole world. It serves the needs not only of those engaged in food bacteriology, but of workers, such as those in the Council's industrial Injuries and Burns Research Unit at Birmingham, who are studying the nature of cross-infection of wounds.

The report mentions the many problems that remain to be solved. The nature of the toxic substances produced by different food-poisoning organisms has still to be worked out. The tissues on which the toxins act and the means by which they produce their effect are likewise unknown.

* *Report of the Medical Research Council for the Year 1951-1952*. Pp. 241+iv. H.M. Stationery Office. Price 6s. 6d. net.

News from the Industry

FORTHCOMING EVENTS

The Royal Institute of Chemistry

Among the October meetings of the Royal Institute of Chemistry are:

Oct. 5. "Recent Developments in the Chemistry of Metal Oxides," by A. J. E. Welch (with the London Section of the Society of Chemical Industry) at the Chemical Society, at 6.30 p.m.

Oct. 8. "The Polarography of Organic Compounds," by J. E. Page at the South-East Essex Technical College, Dagenham, at 6.30 p.m.

Oct. 12. "A Fresh Approach to Heterocyclic Chemistry," by Prof. A. Albert at the Royal Institution, at 7 p.m.

Oct. 16. Fifth annual dinner and dance at the Holborn Restaurant at 6.30 p.m.

Oct. 21. "The Physics and Chemistry of Detergent Solutions," by K. G. A. Pankhurst at Isleworth Grammar School, at 7 p.m.

*

The Nutrition Society

The Nutrition Society is holding a symposium jointly with the Royal Geographical Society at the Royal Geographical Society's rooms, Kensington Gore, S.W. 7, on Monday, October 26, on the subject of "The Provisioning of Expeditions in the Field."

The chairman will be Sir Edward Mellanby, C.B.E., K.C.B., F.R.S., and the following contributions have been arranged:

Dr. G. C. L. Bertram: "The Evolution of Polar Rations."

Prof. R. A. McCance, C.B.E., F.R.S., and Dr. G. R. Hervey: "Emergency Rations."

Prof. B. S. Platt, C.M.G., and Dr. R. H. Fox: "Planning Food Supplies for Tropical Expeditions."

Dr. L. G. C. E. Pugh: "Nutritional Aspects of Himalayan Mountaineering."

Dr. H. G. Smith: "Army Operational Rations."

Squadron Leader D. G. V. Whittingham, R.A.F.: "Royal Air Force Emergency Rations."

The symposium will start at 2.30 p.m. Further particulars may be obtained from the Programmes Secretary of the Nutrition Society, Dr. R. J. L. Allen, c/o Monkhouse and Glasscock Ltd., Snowsfields, London, S.E. 1.

From the Sea to Malt Vinegar

Mr. Toni Fairburn Ripley, son of Mr. G. F. Ripley, chairman and managing director of the Yorkshire Vinegar Company, was married on August 4 to Miss Shirley Ann Temple of Bardsey, nr. Leeds.

The bridegroom is leaving the Blue Star Line, where he was 2nd Officer on the *Timaru Star*, to enter the business of the Yorkshire Vinegar Co.

Presentation on Retirement

Mr. L. D. Coombe, who resigned from the Adhesives Manufacturers' Association at the last annual general meeting after serving as President for 12 consecutive years, has been presented by the Association with a gold watch suitably inscribed, as a token of the esteem in which he was universally held and in recognition of his labours on behalf of all members during his long and difficult period of office.

The presentation was made by Mr. R. Francis, the new President, at an informal lunch on August 6.

Biscuit Oven for Brazil

Believed to be the largest in Brazil, a biscuit oven has recently been put into service at the works of Francia and Cia of Rio de Janeiro. Manufactured by The General Electric Company, the three-tray 275 kW, travelling biscuit oven is 7 ft. wide and 48 ft. long and during an eight hour working day bakes five tons of cream crackers and water biscuits.

The oven has eight separately controlled banks of heating elements extending right across the oven and arranged four above and four below the conveyor. Each bank of elements has a mercury-in-steel indication controller with a rigid bulb extending into the oven, together with a suitable relay, pilot lamp, and control push button switch working in conjunction with the relay so that any or all of the heated sections can be cut out if required independently of the main oil circuit breaker.

Controllers are fitted on the side of the oven near the centres of the sections they control and the rest of the control equipment is mounted on a central panel above the oven.

The driving gear for the conveyor which runs straight through the oven and returns underneath and outside it, comprises a 2 h.p., totally enclosed, squirrel cage, induction motor, driving through variable reduction gears arranged at the biscuit discharge end of the oven, the final drive to the main conveyor chain shaft being by chains and wheels.

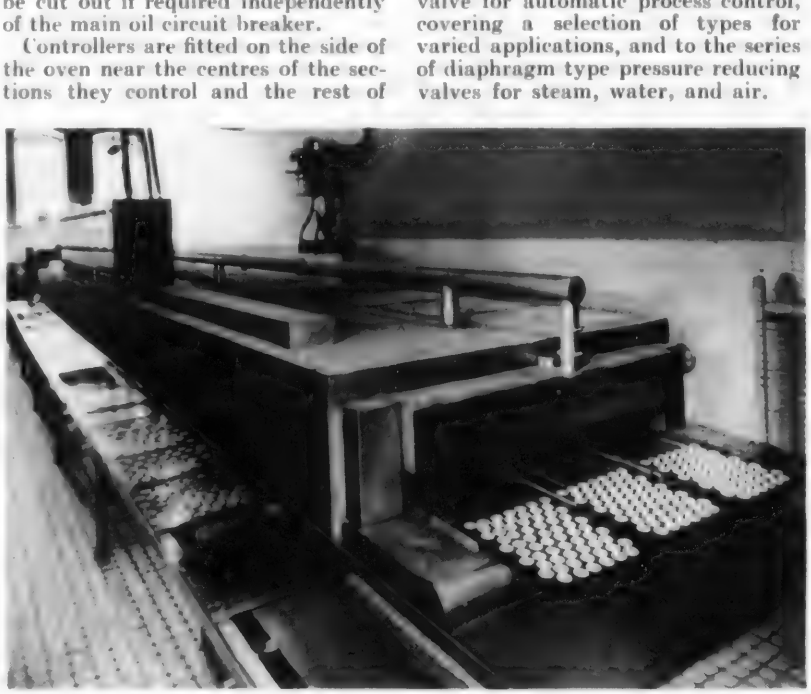
The range of baking times obtainable through the variable reduction gear is arranged as required within the limits of 3½ to 20 minutes.

Industrial Valves

A considerable variety of examples from their extensive range of valves and related equipment for power station, industrial, and marine services was shown by J. Blakeborough and Sons at the recent Engineering, Marine, and Welding Exhibition.

Among the items exhibited were gunmetal and forged steel stop valves; parallel slide valves; non-return valves; sluice valves; and oil-ship valves. An example of the latest design of "free-acting" type reflux valve, as specially developed for conditions on the discharge side of modern centrifugal pumps was also shown together with the horizontal streamline pattern non-return valve, for minimum pressure drop on low pressure steam lines.

Special displays were devoted to the Hammel-Dahl diaphragm control valve for automatic process control, covering a selection of types for varied applications, and to the series of diaphragm type pressure reducing valves for steam, water, and air.



Cooked biscuits ready for unloading from the G.E.C. travelling oven at the works of Francia y Cia, Rio de Janeiro.

Brand Name Changed

Beginning in September, 1953, the traction, commercial, and car starter batteries manufactured by Crompton Parkinson will be marketed under the brand name "Crompton," thus superseding the name "Young" which has been used for over 25 years since the Young Accumulator Co. began manufacturing in 1927.

Oils, Fats, and Waxes

A special course of lectures on the recent chemistry of oils, fats, and waxes, with special reference to analytical methods, is being held in the Department of Chemistry and Biology of Acton Technical College on Fridays at 7.30 p.m., commencing on September 25.

The following are details of the course:

1. Further progress on the autoxidation of component fatty acids and esters. Some new soaps of the unsaturated fatty acids. Two lectures by J. H. Skellon on September 25 and October 2.
2. Recent developments in methods of analysis of oils and fats. Four lectures and demonstrations by C. Whalley on October 9, 16, 23, and 30.
3. Ultra-violet and infra-red absorption spectroscopy in the analysis of oils and fats. Three lectures by N. H. E. Ahlers on November 6, 13, and 20.
4. The modern analysis of waxes. Three lectures by L. Ivanovsky on November 27, December 4 and 11.

Dairy Technology

Two series of advanced lectures on special aspects of dairy technology will be held at the Chelsea Polytechnic during the autumn and spring terms. All the lectures will be given in the Chemistry Lecture Theatre on Tuesdays at 7.15 p.m. as follows:

First Series:

Nov. 3. "Milk Quality," by Dr. A. L. Provan.
Nov. 10. "Management," by Mr. J. F. Hunter.
Nov. 17. "Farm Advisory Work from the Dairy," by Miss B. M. Fischer.
Nov. 24. "Developments in Dairy Machinery," by Mr. J. Matthews.
Dec. 1. "Transport," by Mr. R. Harvey.

Second Series:

Feb. 2. "Quaternary Ammonium Compounds—Their Mode of Action and Applications," by Mr. J. C. L. Resuggan.
Feb. 9. "Some Aspects of Chemical Disinfection in Cowshed and Dairy," by Mr. A. H. Walters.
Feb. 16. "Practical Detergency in the Dairy," by Dr. R. J. MacWalter.
Feb. 23. "How to Save Money in the Dairy Laboratory," by Dr. J. G. Davis.

The cost of admission to each series of lectures will be 7s. 6d.

A typical installation of an ALM band conveyor.

Mechanical Handling

A wide range of conveyors, elevators, trucks, trolleys, stillages, pallets, and tow-lift equipment to meet all handling and storage requirements is manufactured by A. L. Marshall (Carlton) Ltd. Among these are the standardised unit band conveyors, the use of which creates a continuous flow between processes and departments. Standard band widths range from 6 in. to 36 in. in 6 in. stages and various types of band, *e.g.* solid woven cotton, plastic covered, and tasteless rubber, can be fitted; the company can also supply special widths on request. Because of their unique construction, these conveyors can be extended quickly and cheaply, band speeds can be constant or variable, and the units can be supplied with such fitments as automatic electric stop gates and photoelectric relay equipment.

Other types of conveyor supplied by the company are portable band conveyors operating at variable heights, the Pacemaker, operating as a horizontal band conveyor and as an inclined conveyor at various heights up to 7 ft. 6 in., and the Handiveyor portable model which has a length of 6 ft. and is recommended for operating between machines or processes.

Band elevators are available for operating between basement and ground, first, second, or third floors and the company also manufactures a gravity roller conveyor which incorporates straight sections, bends, junctions, and bridge sections, together with fixed and variable height stands.

Mr. Adolph Dingfelder, export executive of Felton Chemical Company, has left on a trip for France. He will represent the company at the opening of new office and plant facilities of the company's French affiliate, Felton Company France, S.A.R.L. in Versailles.

Synthetic Milk Powder

A low sodium synthetic milk powder designed specifically to replace milk in low sodium diets for infants and adults is being marketed under the name of Edosol by Trufood. Its composition and nutritional value are similar to those of cows' milk and on reconstitution with water to a 12½ per cent. solution it has approximately the same protein, fat, carbohydrate, and mineral content. While the sodium content of cows' milk is 14·2 mg. per ounce, the sodium content of the new product is not more than 1·0 mg. per fl. oz.

Mild Steel Drums

A further standard in the series covering mild steel drums issued by the British Standards Institution covers heavy and light duty full open top drums with removable heads. The drums are subdivided into four classes, but it will be appreciated that a standard of this kind must cover so many types that it remains essential for users to ensure that the gauge of metal they select for a particular drum is adequate for the performance required.

Aluminium Milling Plant

FIRE AND INFESTATION RISKS REDUCED

The first all-metal flour mill installation in the world was recently put into use at Driffield, Yorkshire, a successful development which is to be followed by other installations at Manchester and elsewhere. One of the primary advantages in the use of metal is the reduction in the fire risk with the possible accompaniment of lower insurance costs.

Prior to the production of this type of machinery, considerable research was undertaken by the development organisation of Henry Simon Ltd. in conjunction with the Warwick Production Co., Ltd., aluminium extrusions being supplied by Southern Forge Ltd. Among the developments was a low-pressure pneumatic conveying system, the ducts for which are made up of prefabricated lengths of aluminium alloy that are easily assembled on site. Some of the Simon all-metal machines are already familiar to those engaged in flour mill engineering, but certain additional units have been specially designed to fit into the latest type of installation. All have been arranged to give ease of cleaning and to reduce to a minimum the risk of infestation.

The three most important machines in flour milling are the rollermill, the plansifter, and the purifier. The rollermill has always been made in metal, because of the necessity for accurate support of heavy grinding rolls, but until now the other machinery has been of wood.

The main frame of the plansifter is built in the form of a rigid plate girder; steel channels extend along all four sides and the rectangle thus formed is braced by a central casting, which carries the housing for the bottom bearing of the driving shaft.

To avoid condensation from the warm stock, which becomes heated during the grinding process, the machine has a double metal skin on the same principle as the domestic vacuum flask. Facings and the inner and outer door are made from pressed aluminium and the end panels from folded aluminium sheet. The trays which hold the sieves (all identical and interchangeable) are made from corrosion-resisting aluminium alloy by a form of pressed and welded construction. Die-cast outlet boxes, made from aluminium pressings, replace the wooden type. Special nylon fabric is employed for the sieves and another type of nylon material for the trunking.

The Flowmaster plansifter, a rotary sifting machine with nests of sieves, made in aluminium. *Photo Henry Simon Ltd.*

The purifier is constructed basically of various pressed, folded, and extruded aluminium sections, being designed to minimise the risk of insect infestation by the elimination of pockets. Cleaning is simple, as easily removable parts are incorporated.

Another streamlined unit built up from aluminium extrusions and pressings is the suction filter dust collector for which an efficiency of practically 100 per cent. is claimed.

Designed by Richard Lonsdale-Hands Associates for the Peek Frean assorted cocktail biscuits, this new pack shows the contents in their natural sizes and colours against a blue background.

Humidity Slide Rule

Used for ascertaining relative humidity from wet and dry bulb thermometer readings, the Hygrorule manufactured by Short and Mason obviates the necessity for reference to tables. Convenient in size and protected by a strong leather case, the rule is made of white plastic, mounted on a wood back, with bold figures and graduations. Two scales are provided on the reversible slide, one for screen, and the other for aspirated thermometers.

Refrigeration Film for Technicians

Growing interest in their V/W compressors for refrigeration and air-conditioning duties has prompted York Shipley to produce another of their sound-slide-films to deal with the subject.

After some preliminary frames describing early development, the film gives a detailed and informative description of the equipment, and finishes with some typical applicational advantages.

The pictures are extremely clear and the commentary, recorded by Frank Phillips of the B.B.C., is concise and to the point It is a film well worth seeing by engineers and other technical men.

Arrangements are complete for showing in any part of the British Isles, and interested persons should apply to the company's head office at North Circular Road, London, N.W.2, or to any of their branches.

Nylon Driving Belts

New belting consisting of a nylon core with an interwoven cotton cover has been developed by Lewis and Tylor. Since nylon has a tensile strength three to six times as great as that of natural fibres, it is possible to make the core considerably less in cross-sectional area than a normal belt, yet with greater strength. The cotton cover, which completely surrounds the nylon core, has a high natural frictional coefficient which is further improved by impregnation with a proofing compound.

Nylon is free from microbiological attack; thus the belt never loses strength from this form of decay. The cotton-nylon construction has a further advantage: by concentrating the stress-bearing material of the belt on the natural axis of bending, great flexibility is achieved; this is further improved by the type of weave used in the cotton cover.

The wide adoption of the new belt is held up at present by the limitation in the supplies of nylon yarn, but it is hoped that within the next two years this situation will materially improve. Meanwhile new belts are being produced at a rate which will enable most industries to give them a practical trial.

Government Scientific Policy

The Sixth Annual Report of the Advisory Council on Scientific Policy, which was set up in 1947 to advise the Lord President of the Council in the exercise of his responsibility for the formulation and execution of Government scientific policy, has recently been published.

The report is devoted to a special study of the "Exploitation of Science by Industry," and refers to the need to increase the supply of scientists and engineers for industry.

In his speech of June 11, 1952, Lord Woolton announced the Government's intention to build up at least one institution of university rank devoted predominantly to the teaching and study of the various forms of technology. This was followed on January 29, 1953, by a further announcement of a proposed major expansion of the Imperial College of Science and Technology and of the Government's intention to make resources available for further developments in other parts of the country.

The Council's report emphasises the great need for a significant increase in the volume of investment in industry. It will be recalled that various measures proposed in the last Budget were directed to this end.

Modernisation of Liverpool Factory

Modernisation of their Liverpool Works, involving the installation of up-to-date machinery, has recently been undertaken by The Liverpool Borax Co.

Some of the raw materials used require to be disintegrated. This is done in a special rotary tooth-breaker situated on the first floor from which the materials are conveyed automatically by means of elevators to the mills. The ingredients, now of a uniform fineness, are then fed by gravity to the mixer situated on the ground floor, thus ensuring intimate blending of the different chemicals making up the batch. The finished product is drawn off into suitable containers.

New spraying and mixing plant has been installed for manufacturing the wool scouring products, paint cleaners, etc.

The mixers situated on the first floor are fed by a feeder/elevator, the material being tipped into this, from the first floor, and elevated into the mixer.

Spraying apparatus is arranged so that correct quantities can be added to the mixer accurately. This is done by a series of storage tanks, the liquid being sprayed into the mixer through nozzles by means of pumps. The final mixed material is then fed by gravity to the automatic fillers situated below.

The major part of the above plant has been supplied and erected by Wm. Gardner and Sons (Gloucester).

A bulk sugar tanker is backed up to the receiving point at the factory. In the tanker are 13 tons 8 cwt. of loose sugar—a day's supply for the Wall's Godley factory.

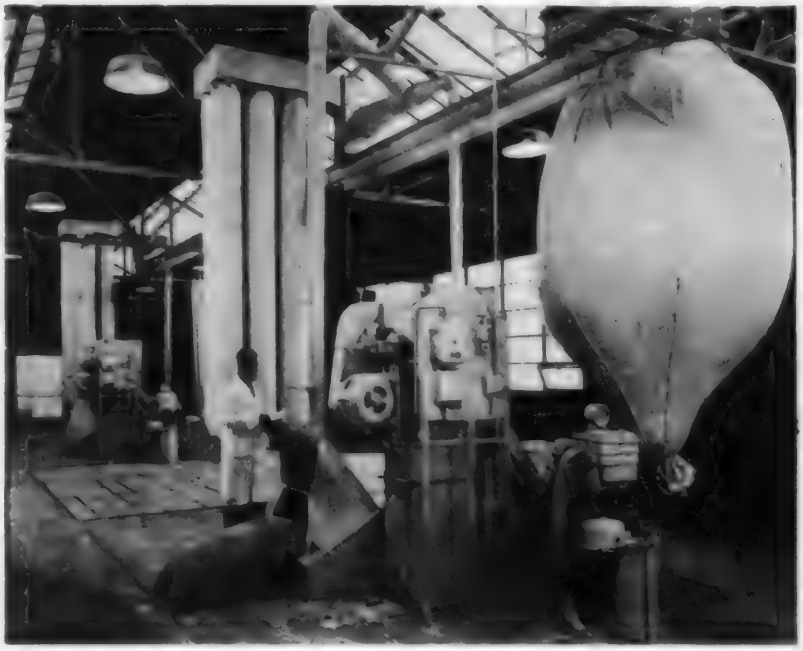
Bulk Handling of Sugar

Machinery for speeding up off-loading and handling of large quantities of sugar used in the manufacture of ice cream has now been installed at Wall's Godley factory.

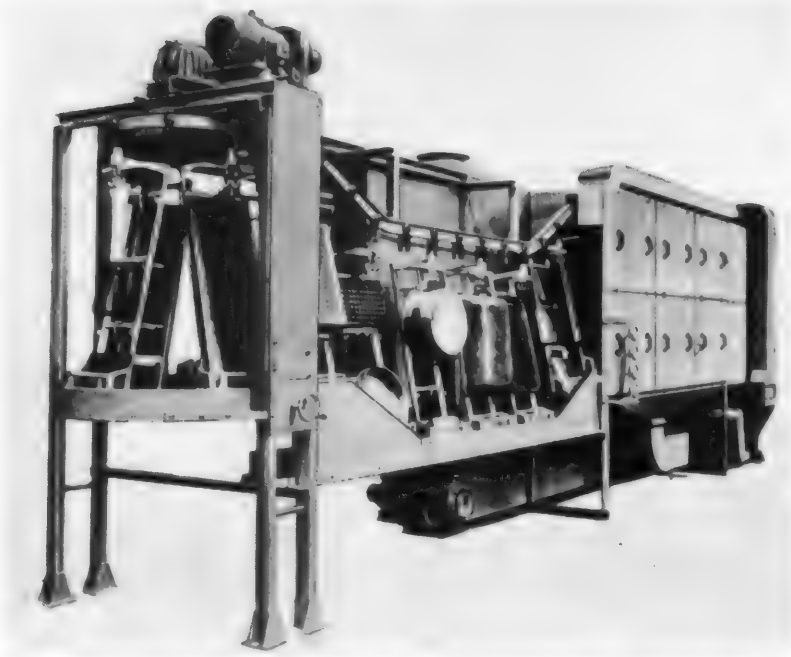
When the tanker is tipped, the released sugar falls into a small well out of which it is scooped by a bucket-type elevator and lifted at the rate of 25 tons per hour into a storage bunker holding 37 tons.

At the bottom of the V-shaped bunker, there are a number of vents controlled by sliding plates, through which the sugar falls into a screw-type conveyor feeding into a bucket elevator which raises it to the factory roof, and then *via* a further screw-type conveyor to the mixing room, where it is automatically weighed and fed into the mixing vats without having been manually handled in any way.

The whole of the withdrawal conveyor system from the bunker is operated by press-button electrical control in the mixing room.



On the first floor of The Liverpool Borax Company's works the mixing plant discharges direct into bags and other suitable containers.



The Dawson washing, rinsing, and drying machine for manufacturing confectioners.

Utensil Washer and Steriliser

A washing, rinsing, and drying machine, specially made to meet the requirements of a large firm of manufacturing confectioners, is capable of handling more than 400 assorted utensils and trays per hour.

The principle of the machine, manufactured by Dawson Bros., is a mono-rail type of conveyor with a low level point for loading and unloading. One operator can handle the whole capacity of the machine, unloading the cleaned items and loading the soiled ones at the same point.

The treatment given is recirculated detergent washing, followed by recirculated hot rinse, scalding rinse, and on the return the utensils are dried in the steam-heated lagged drying chamber. The machine, which is equipped with a variable speed and is metal sprayed in the washing section, is arranged for steam heating throughout.

Food, Drugs, and Water

A special course of lectures and practical work based on the syllabus of the examination for the Fellowship of the Royal Institute of Chemistry (Branch E) will be given for first year students at the Chelsea Polytechnic on Tuesdays and Thursdays, 6 to 9 p.m., beginning Tuesday, September 29, 1953. The course extends over two complete sessions.

The syllabus is as follows:

Food.—Origin, composition, and methods of analysis. Identification and determination of adulterants, impurities, preservatives. Vitamins. Microscopical examination of food.

Drugs.—Chemistry, analysis, and microscopy of drugs: their pharmacological action and therapeutic values. Alkaloidal assay and examination of pharmaceutical preparations. Chemotherapy.

Water.—Chemical and bacteriological examination of water, sewage, and effluents. Microscopical examination of water deposits.

Bacteriology.—Milk, water, food preservation, food poisoning. Sterilisation. Antiseptics and disinfectants.

Toxicological Analysis.—Detection of poisons and blood stains. Examination of urine.

Acts and Regulations relating to food, drugs, and poisons.

Health Congress President

The invitation of the Royal Sanitary Institute to act as President of the Health Congress which is to take place at Scarborough from April 27 to 30, 1954, has been accepted by the Right Hon. the Earl of Feversham, D.S.O., D.L., J.P.

Lord Feversham was chairman of the Committee of Enquiry into the Voluntary Mental Health Services which produced the Feversham Report in 1939.

APPOINTMENTS AND RETIREMENTS

Mr. George W. Muddiman, chairman of Birds Eye Sales, has been named President of the National Association of Quick Frozen Food Processors for the 1953-54 term.

■

The new chairman of Peerless and Ericsson is Mr. W. F. Hammond, who has taken over the chairmanship from Sir John Fox, O.B.E., who remains on the Board. Mr. Hammond has been connected with the City of London professionally for some 40 years and is a member of the Guild of Freemen of that City.

■

Mr. James Henry Halliday, F.R.I.C., has been appointed chief analytical chemist at Wall's London laboratories.

Mr. Halliday will be responsible to the chief chemist, Dr. S. M. Herschdoerfer, for the analytical control of raw materials and finished goods and will be concerned also with other work affecting the general improvement and development of the firm's products.

■

The chairman and directors of W. J. Bush and Co. announce that Mr. H. W. Vernon, B.Sc., F.R.I.C., has been appointed a director of the company.

Mr. Vernon joined the company in 1916, after taking his degree at Manchester University, and as a result of the examination became a Mercer Research Scholar. For the next five years he conducted special studies on behalf of the company at Oxford University under the supervision of the late Professors W. H. Perkin and N. V. Sidgewick.

Mr. H. W. Vernon.

In 1922, on his return to the London Headquarters of the company, Mr. Vernon took up his duties in the research laboratory with which he has since been associated. In 1932 he assumed additional responsibility for general chemical development, culminating in 1948 in his appointment as Chemical Superintendent supervising the technical operations of the company's three chemical factories in the U.K.

OBITUARY

Mr. William Reading Bufton, Ph.C., F.C.S., J.P., deputy chairman of William Evans and Co. (Hereford and Devon) Ltd., on July 27 at the age of 71.

Regarded as an authority on cider, Mr. Bufton had been associated with the company for the last 50 years, during which time he saw the change in cider drinking habits from draught to bottle cider. Following the 1914-18 war, Mr. Bufton was largely responsible for the introduction of pectin manufacture to this country and for many years he pioneered the industry.

In more recent years, he was chairman of the National Association of Cider Makers.

Until his recent retirement due to ill health, Mr. Bufton was a director of the parent company, Webbs at Aberbeeg, and prior to his appointment as deputy chairman to William Evans, he served as managing director for many years.

ERECTIONS AND EXTENSIONS

The bottling plant at Park Stores, Holyrood Road, Edinburgh, is to be extended by William Younger and Co. at an estimated cost of £95,000.

*

Extensions are to be made by William Crawford and Sons to their factory at Salamander Street and Bath Street, Leith, at a cost of £75,000.

*

Plans have been submitted by J. Lyons and Co. to erect an extension to their bakery in Addiscombe Road, Margate, Kent.

*

Dowlings Chocolates, Ltd., are planning to rebuild their factory premises at the rear of Marine Terrace and Belgrave Road, Margate, Kent.

*

Plans have been passed for the reconstruction and extension of Gories' sausage factory behind Chester Road, Stretford.

*

Plans have been approved for the construction of a new bakery by Jarrow and Hebburn Co-operative Society, Albert Road, Jarrow, on a site at Calfclose Lane, Jarrow-on-Tyne.

*

The recent growth of the Purchasing Officers Association, which now has 40 branches and groups in most of the large centres in the U.K., and also in Australia and South Africa, has necessitated a further expansion in the head office accommodation.

The Association has now taken over the remainder of the first floor offices at Wardrobe Court, and an additional extension telephone line has also been arranged to meet the greatly increased traffic. The Association's new telephone number is City 3841/2/3.

*

A new cheese-making factory is being developed at Lockerbie in Dumfriesshire by Northern Wholesale Dairies. This subsidiary of Independent Milk Supplies is using a former war-time area which was bought recently and is to add a £9,500 extension consisting of a large holding tank, a laboratory, and a milk loading platform. These extensions will greatly assist the development of the plant, which is engaged on the processing of milk from some 250 farms in surrounding areas.

OBITER DICTA

● Pork butchers may sell pork again.—"*Meat Marketing.*"

● Obesity is the commonest nutritional disease in Britain. —*Dr. A. P. Meiklejohn.*

● Refrigeration does not improve food, it only delays decay.—"*City Press.*"

● Is it to the chemist that we must look for the provision of extra foods in the future?—*James Lawrie, writing in the "Irish Times."*

● British women are not bad cooks, but their menfolk are often bad eaters; this means that the whole family have their palates blunted.—"*Western Mail.*"

● Obviously, no one will eat his way into the Kingdom of Heaven, but behaviour patterns appear to be influenced by good and bad nutrition.—"*Man's Foods,*" *by L. B. Jensen.*

● What a pass we have come to when the price of bacon is going down because the stocks are not being cleared, and the price of eggs is going up because the hens are laying fewer while people want to eat just as many.—"*Sunday Times.*"

● We have already suffered by tearing down the great houses of London, so that the Government has landed itself in the position of being unable to give a cocktail party to Miss Margaret Truman without turning out the London Museum.—*Lord Esher.*

● Those engaged in the chemical industry are drawing towards the reign of nylon, they are putting the cotton plant out of business, they are knocking out the sheep, and have even tried to make milk which no self-respecting cow will acknowledge.—*Sir William Ogg, at the Annual General Meeting of the S.C.I.*

● Perhaps the absence of cats in Swedish towns results from a bye-law which states that domestic animals can only be allowed on the streets accompanied by their owners; let us have better handling of foodstuffs, cleaner restaurants, but let us not encroach so far on the liberty of the British cat.—*Letter to the "Manchester Guardian."*

BOOKLETS RECEIVED

Several new brochures have been produced by Allspeeds illustrating the adaptation of the Kopp variator.

*

The subjects of *p*H measurement, moisture measurement, and industrial X-ray apparatus are discussed in a recent publication of Marconi Instruments.

*

A new illustrated guide to nutrition, prepared by dietitians and medical experts, and published at 2s. by Energen, gives specimen menus, food value tables, an 18-day weight-reduction diet, and advice on weight control.

*

The extent to which industrial chemical glasswear, manufactured by Quickfit and Quartz, can answer the problems encountered in the field of hydrogen chloride absorption is set out in a new pamphlet issued by the firm.

*

The modifications made to the *p*H indicator manufactured by the Cambridge Instrument Co. are described and illustrated in a revised edition of the company's leaflet which also includes details of a new submersible electrode system for industrial applications, designed for direct immersion in the tank of solution.

*

A 44-page octavo booklet, published by the British Plastics Federation, is claimed to cover all the more important plastics materials produced in Great Britain.

Each of the 17 sections has a note of the more important uses of the material concerned, the names and addresses of the member-firms supplying it, and the trade names used. All are indexed separately for easy reference.

Antioxidants in Food

The sole distributors for the series of gallic acid esters manufactured by Nipa Laboratories under the trade name Progallin are P. Samuelson and Co., from whom samples and prices can be obtained.

World Food News

Viennese Biscuits in Ireland

A branch factory of Manners A. G. Vienna, is to be established at Coleraine, Co. Derry, for the manufacture of biscuits. Among the specialities to be made in this Northern Ireland factory are the chocolate hazelnut-filled wafers for which the Viennese company became famous.

Flavour Development

With the restriction on the use of coumarin by the Federal Food and Drug Department, it has been necessary for some replacement to be found. Protovanol C, developed by the Florasynth Laboratories, of New York, meets the necessary requirements. It is the approximate equivalent of coumarin in strength, is fully soluble in alcohol, propylene, and to an extent even in vegetable oils. Readily mixed in various dry bases, this new product is readily absorbed in cane sugar, corn sugar, or starch.

Rangoon's New Milk Plant

Eight Burmese delegates left London by air recently for Rangoon after completing their government's largest combined overseas order since the country's independence in 1948.

One of the companies to gain contracts was The Creamery Package Manufacturing Co. who have the initial order to build a sterilised milk plant near Rangoon shortly. This will be the first plant of its kind to be installed in Burma.

Indian Food Problem Ended

India's food problem has ended and her food imports, which stood at more than four million tons in 1952, will be cut to a million tons next year, according to the Food Minister.

He added that the country's internal rice production would be sufficient to meet all rationing commitments and no imports would ordinarily be required. However, if rice were available at a price comparable to that ruling internally, then India might buy about one million tons to build a reserve stock and do away with rationing. India had already refused offers of rice from Burma, China, and Thailand. Rice production in 1952-53 was 23,400,000 tons and the prospects for next year were even better.

India's wheat harvest of 6,762,000 tons this year was the highest since the 1945-46 season, and not more than one million tons would be imported next year, an amount which the country was committed to buy under her agreement with the International Wheat Board last May.

Food Exhibition in Montreal

A Food Exhibition will be held in the Show Mart Building, Berri Square, Montreal, from October 14 to 18, 1953. Exhibitors will be manufacturers and their exclusive representatives; direct sales to the public will be permitted.

U.S. Butter Surplus

The United States Agriculture Department is donating 10,800,000 lb. of surplus butter to needy people in Austria, Trieste, Italy, and Germany.

The butter will be distributed by the War Relief Services of the National Catholic Welfare Conference. The Conference will pay the cost of transporting the butter from points of shipment to distribution centres abroad.

Hungary Tries New Grinding Method

Experiments are being made at a Hungarian flour mill with a new method of grinding which, it is claimed, gives finer flour than older methods.

Instead of using a roller in the first stage, as at present, a cutting apparatus is introduced which slices the grain into four pieces before it goes to the roller.

Birds' Nest Soup

In the islands of Thailand, the nests of certain birds—swifts of the genus *Collocalia*—are collected and marketed to epicures of Oriental foods.

The nests, which are built on the smooth sections of cavern walls, are made from a gelatinous substance which is ejected from the birds' powerful salivary glands in thread-like strands which harden when dry. When completed, the nests look as though they have been woven of heavy threads of a translucent material resembling plastic fibres. Under ordinary circumstances, the birds add no other material to the nests, which are collected three times a year by two concessionaires who pay large premiums for their contracts.

The collection of the nests is a hazardous and skilled occupation, the collectors working several hundred feet above the floor of the cave, either perched on top of long bamboo poles, used as ladders, or crouched in baskets, lowered through crevices in the mountains. By torchlight, the collectors pry the nests from the walls of the caverns with a flat-bladed knife attached to the end of a bamboo rod.

Sometimes the nests are placed in bags as they are gathered, but often they are allowed to fall to the floor below, where they are picked up by the collector's assistants.

The nests are brought from the islands in large boxes, sorted, and graded. Such foreign materials as bits of feathers are removed from the nests, which are further cleaned by brushing. Rough edges, particularly the heavy portion by which the nest is attached to the wall, are removed with a sharp knife. Finally, the nests are packaged and ready for sale.

The nests are valued according to lightness of colour, firmness of texture, absence of foreign materials, and perfection of form.

Whaling By-products

During the last whaling season in the Antarctic, the output of by-products amounted to 60,958 tons, including 25,500 tons of whale meal and guano, 155 tons of whale liver oil, 456 tons of liver meal, 134 tons of meat extract, and 28,000 tons of whale meat. The production of whale oil by the 16 floating expeditions and three shore stations was 2,114,625 barrels, equal to about 350,000 tons.

Shark Carcasses to be Processed

Shark carcasses from Achill, Co. Mayo, will be processed at a new £100,000 factory to be erected at Lurgan, Co. Armagh, early next year, by Ulster Farm By-products Ltd. Farmers have subscribed the share capital. The factory will make fish meal and cat foods.

Livestock which are normally a loss to members of the Ulster Farmers' Union will also be processed at the new factory.

Food Factory for Clonskeagh

A new factory has been opened by Chivers and Sons (Ireland) at Beech Hill, Clonskeagh, Dublin.

The new factory, which stands on a five-acre site in picturesque surroundings overlooking the River Dodder, comprises a range of buildings of modern design. Each of the floors is devoted to fruit sorting, jelly boiling, jam and marmalade making, filling, cooling, packing, storing, glass washing, or inspection. The factory plant and equipment is mainly of the company's own design.

Chivers jellies were first sold in Ireland about 1898. From then until 1932 they were imported along with the company's jams and marmalades. The company uses Irish raw materials and ingredients. An increasing acreage of strawberries, raspberries, blackcurrants, and gooseberries is grown under contract for the company in selected areas.

OVERSEAS ENQUIRIES

Gin, Whisky, Liqueurs, and Biscuits

"Liquor," S.R.L., of Genoa, have expressed interest in representing United Kingdom distillers of gin, whisky, and liqueurs and manufacturers of biscuits.

The Italian firm has recently been formed by Ragioniere Vincenzo Severino in partnership with Signor Ubaldo Dagnino for dealing in imports and exports and in the representation of foreign brands of wines, liquors, and alimentary products.

■

Agency for Flour

Garnett and Co., Ltd., of P.O. Box 223, Georgetown, British Guiana, wish to obtain the representation of United Kingdom flour millers.

United Kingdom manufacturers who are interested in this enquiry should communicate direct with the company at the above address.

■

Breakfast Cereals

Ed. A. Keller and Company Limited, P.O. Box 659, Edinburgh House, Hong Kong, are interested in representing United Kingdom manufacturers of breakfast cereals.

United Kingdom firms interested in this enquiry should write direct to the company, sending details of their products, literature, c.i.f. prices and samples if possible.

■

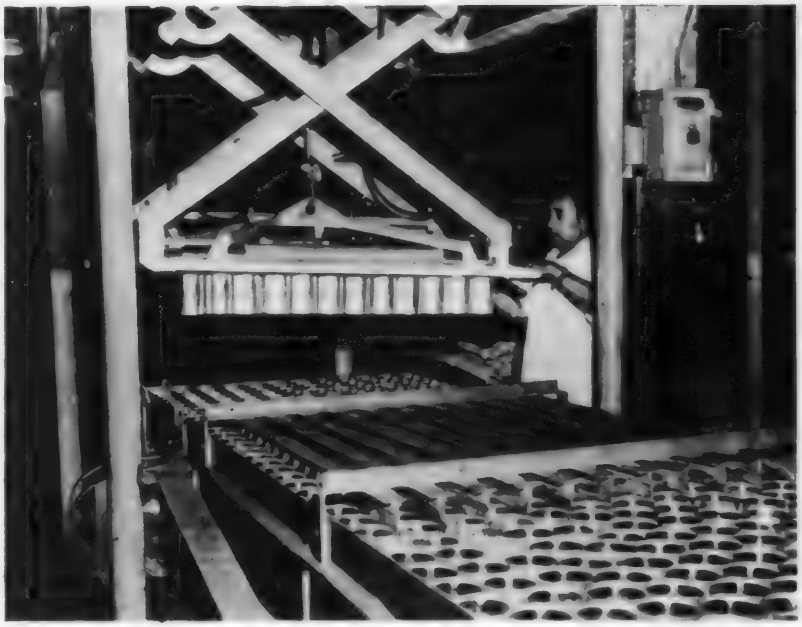
Foods in Special Packaging

Messrs. Hemisphere International Corporation, Hibernia Building, New Orleans 12, Louisiana, have expressed interest in receiving quotations for Christmas gift items such as delicacies, preserves, or some other food item. Original and attractive packaging is essential and no "overworked" item will be considered. A quantity of 6,500 units is required and the cost per unit landed in New Orleans, including duty, should not exceed $2.00 (14s. 3½d.).

As a guide the items purchased in previous years have included honey packed in an old fashioned "moonshine" type jug, country sorghum packed in a demijohn stoneware jug, and 100 per cent. pure maple syrup and buckwheat flour. It is not necessary that offers should conform to past patterns, but the need for originality in packaging cannot be overemphasised.

Quotations should be in United States currency c.i.f. New Orleans, including duty, if possible, and all offers should be sent by air mail to Mr. L. M. Westbrook of the United States firm. Samples are essential and may be sent if wished to the Consulate-General in New Orleans.

All foodstuffs destined for the United States are subject to the United States Food and Drugs Administration Regulations.



By pressing the hoist raising button, the load of cans is lifted by means of the suction head and then lowered on to the pallet.

Equipment for Handling Hot Cans

New palletising equipment built by Standard Knapp has been installed at the Hawaiian Canneries.

The machine consists of two basic units: one for palletising filled cans after cooling and the other for depalletising when the cans are ready for labelling and packing into cases. The first of these comprises a load-forming device consisting of a series of chains in a compact frame supported by four legs. This unit arranges the cans in a definite pattern according to the size of the cans and of the pallet. The second is a suction head attached to a standard electric hoist suspended from a trolley; supporting this unit is a superstructure.

The filled cans come from the cooler in either single or multiple line, standing or rolling. If rolling, then they must be run through a twister, the cans then entering the forming device and assuming the desired pattern.

The suction head of the palletiser is moved over the layer of cans, picks it up, swings it laterally, and deposits it on a pallet. Tier after tier is loaded in this way, a fork truck moving the filled pallet to the warehouse.

In the suction head are a multitude of vacuum cups arranged to match the pattern into which the cans have been formed. These cups are all connected by means of headers, to a single manifold, and the manifold is connected to a dry vacuum pump by a rubber hose. From 18 to 20 in. of vacuum is maintained.

Control of the vacuum is through a valve operated by an easily accessible lever mounted on the suction head.

Also contained in the suction head is a double-door type fastener that locks to two vertical angle-iron supports; these define the position of the pallet on the floor, and the alignment of the pallet and suction head. Operation of the fastener is *via* the above-mentioned vacuum actuating lever.

With the suction head in position above the load of cans in the forming device, the operator presses the hoist lowering button until the vacuum cups in the head rest on the cans. He then pushes the vacuum control lever forward thus anchoring the head to the cans by means of the suction cups. At the same time he operates a foot pedal to disengage the drive to the load-forming device and removes the pressure exerted by cans feeding the unit.

He then moves the loaded suction head forward to break any headlocks that may exist between the cans attached to it and those remaining on the forming device.

By pressing the hoist raising button, he lifts the load of cans, and moves the entire assembly on its trolley until the two locks on the door catch place the cans over the pallet.

By pushing the hoist lowering button, the load of cans is set on the pallet. The vacuum valve and lock controlling lever are pulled out, releasing the cans and unfastening the position locks. Then the suction head is raised and returned to the starting position over the forming device.

A sheet of kraft paper is placed on the top of each tier of cans as it is deposited on the pallet. This binds the tiers together and absorbs fluid from leaking cans thus protecting other cans from spillage.

News from the Ministries

APPOINTMENTS

Mr. R. F. Tyas, an Assistant Secretary, Ministry of Health, has been appointed a member of the Food Standards Committee in succession to Mr. P. N. R. Butcher, O.B.E., who has retired.

Mr. E. G. Harwood, C.B., has been appointed a Deputy Secretary of the Ministry of Food (Supply Department) in succession to the late Sir Albert Feavearyear, K.B.E., C.B.

Artificial Sweetening Substances

The use in food of all artificial sweetening substances except saccharin is now prohibited under the Artificial Sweeteners in Food Order, 1953 (S.I., 1953, No. 1311).

The Medical Research Council, on the recommendation of the Food Adulterants Committee, has informed the Minister of Food that on present evidence they regard the use of certain artificial sweetening substances as ingredients in food as undesirable on health grounds. In the light of this advice, the Minister has decided, in agreement with the Minister of Health and the Secretary of State for Scotland, to prohibit the use of all artificial sweetening substances except saccharin. He will, however, be prepared to consider the exemption of any other sweetening substance shown to be harmless.

Saccharin Tablets

As a result of the Food Standards (Saccharin Tablets) Order, the standard for saccharin tablets has been revised and extended to cover all sweetening tablets containing saccharin. The Food Standards Committee considers that this product, to which the public has become accustomed, will continue to be of some importance even after derationing of sugar and that it is desirable that it should still be sold in a standard form.

The new standard, which came into force on September 1, 1953, for all sales is as follows:

> A saccharin tablet or other sweetening tablet containing saccharin:
>
> (i) shall contain not less than 0·18 grain and not more than 0·22 grain of saccharin or the equivalent weight of soluble saccharin;
>
> (ii) may contain as excipient sodium bicarbonate with or without other suitable substances. The total amount of excipient shall not exceed four times the maximum quantity of saccharin;
>
> (iii) shall not contain more than five per cent. water-insoluble matter, nor less bicarbonate than that required to render the saccharin completely soluble.

It will no longer be necessary for the description "standard" to be applied to saccharin tablets, or for the saccharin content of each tablet to be stated on the packet.

In making this standard, the Minister has had regard to the recommendations of the Food Standards Committee, and to the representations which were received after the Committee's proposals were published in June, 1952.

The Saccharin Order, 1949, which contained the previous temporary standard for saccharin tablets and provisions relating to the retail sale of saccharin and certain other sweetening agents, has been revoked.

New Zealand Lamb and Mutton

Agreement has been reached with the New Zealand Meat Producers' Board, through the delegation headed by Mr. J. D. Ormond, chairman of the Board, on the prices to be paid for New Zealand lamb and mutton in the year beginning October 1, 1953.

Under the agreement with New Zealand, which was signed in 1948 and amended last year, provision was made for annual revisions of price, either by reference to variations in costs of production or up to 10 per cent. by reference to changes in the prices paid to other important suppliers.

As from October 1, 1953, there will be an increase of 7½ per cent. for New Zealand lamb and lamb offals and an average increase of about 5½ per cent. for mutton and mutton offals. On mutton the increase will be varied according to the ranges of weight and quality; as in the case of Australia, the prices of heavy weight mutton will not be increased.

Jam Standards Revised

The Food Standards (Preserves) Order, 1953, has been amended with effect from September 1, 1953. Under this Order the revised standards for damson, gooseberry and raspberry, and gooseberry and strawberry jams and for jams in hermetically sealed containers, came into force on September 1, 1953, for all sales. It was previously stated that the revised standards for these jams would take effect on September 1, 1953, for sales by manufacturers, on January 1, 1954, for sales by wholesale, and on May 1, 1954, for sales by retail. Revised standards are also prescribed for fig and lemon jam and for rhubarb and ginger jam. The total minimum fruit contents are unchanged at 40 per cent. but the minimum lemon and ginger contents will now be, respectively, eight per cent. and one per cent. by weight of the finished jam. These revised standards also came into force on September 1, 1953, for all sales.

Danish Bacon Agreement

As a result of the recent discussions about the import of bacon from Denmark between representatives of the Danish Bacon Factories' Export Association and the Ministry of Food, it has been agreed that the price to be paid for Danish bacon during the 12 months from October 4, 1953, to October 2, 1954, will be 237s. 6d. per cwt. c. and f. U.K. port. The current price is 252s. 6d. per cwt. f.o.b. Danish port.

It has also been agreed to extend for a further two years the existing contract which was due to expire on October 2, 1954.

The maximum quantity to be shipped during the 12 months beginning on October 4, 1953, is 230,000 tons. During the two subsequent 12 month periods the maximum quantity will be 200,000 tons.

Antibiotics for Animal Feedingstuffs

Penicillin and aureomycin (the latter in a restricted form) can now be supplied for use in the food of pigs and poultry, subject to certain safeguards. Hitherto, the use of these antibiotics for feeding to animals has been subject to specific prescription by veterinary surgeons.

They will be available in two forms:

> (*a*) As a concentrated or compound feedingstuff to which the antibiotic has been added before sale to the farmer.
>
> (*b*) As a supplement which can be mixed, in accordance with directions given on the label, by the farmer who mixes his own feedingstuffs.

Under the Therapeutic Substances (Supply of Antibiotics for Agricultural Purposes) Regulations, 1953, the Agricultural Ministers have power to require that certain information shall be given on the labels that must be attached to every container of an antibiotic supplement or bag of feedingstuff containing an added antibiotic. Model forms of label have now been approved, giving information about the antibiotic and about its storage and use.

These labels also bear warnings against feeding the product to ruminant animals and to stock used for breeding.

Farmers who wish to conduct trials under their own conditions of feeding and management, either as supplements, or as additions to compounds and concentrated feedingstuffs, are advised to adhere to the rate of dosage and manner of use of the particular type of product they have purchased, as recommended by the manufacturers.

Dried Fruit to be Decontrolled

Dried fruit is to be decontrolled on December 1, 1953. From that date private imports will be resumed and all controls over prices and distribution will be abolished.

No imports will be allowed before December 1. Details of the import licensing arrangements will be announced by the Board of Trade shortly. Traders will then be able to enter into forward contracts for dried fruit for arrival in the United Kingdom on and after December 1.

Grain Handling in America

An illustrated booklet entitled "The Bulk Handling of Grain in the United States of America" (H.M.S.O. 1s.) describes the American methods of handling grain in bulk and the use of multi-purpose rather than specialised equipment and vehicles for this purpose.

There are already a number of British farmers, merchants, and processors who have adopted bulk handling methods in order to improve the efficiency of their operations, and it is hoped that this booklet will stimulate interest and encourage those traders who are at present hesitant—perhaps in the belief that expensive specialised plant and equipment are necessary—to adopt such methods. It provides information about the way in which existing transport can be adapted to avoid the cost of more elaborate specialised vehicles and describes several types of equipment which have been found satisfactory by American farmers and traders, many of whom are operating on a relatively small scale.

Revolving Fund for Industry

Notes exchanged in February between the Foreign Secretary and the U.S. Ambassador established a programme for the expenditure of the counterpart funds from American economic aid under the Mutual Security Act of 1952 (Cmd. 8776). As part of this programme a revolving fund of £1 million has been set up for short term loans to industry and agriculture. Agriculture receives £300,000, and the balance of £700,000 is available for short term loans to industry for the purpose of increasing productive efficiency.

The President of the Board of Trade has appointed the following independent Committee to advise him on the administration of the industrial portion of the Revolving Fund: Sir John H. Woods, G.C.B., M.V.O. (chairman), Mr. David Colville, Col. E. R. Mayer, T.D., Sir Andrew Naesmith, C.B.E., J.P., Mr. S. J. Pears, F.C.A., Lord Piercy, C.B.E., Mr. W. W. S. Robertson, O.B.E., Dr. Harold Whitehead.

The Committee has already met and has made recommendations, which the President has accepted, as to the types of project which should be aided from the Fund and as to the terms and conditions to be attached to the loans within the framework laid down in the White Paper. The Advisory Committee is now ready to examine individual applications from industry and will make recommendations thereon to the Board of Trade.

In principle, any project which has as its object the raising of productive efficiency in industry is eligible for consideration. This includes any project arising from the recommendations of the Anglo-American Productivity Council reports or of the advisory service provided under the Conditional Aid programme.

As the amount of money available is limited, it will be necessary to restrict loans to projects which will contribute quickly to achieving the purposes of the Fund, and it is expected that most of the loans will be made for new equipment and improvement of plant layout. Preference will be given to small and medium sized firms who can show that the benefits they expect to accrue from a loan will enable them (or their customers) to expand their export trade or to meet essential home requirements more efficiently.

Loans will not normally be granted for periods of more than three years, although in exceptional circumstances up to five years may be considered. Applications are unlikely to be entertained for large sums. The amount and period of the loan and the rate of interest and the security required will be matters for negotiation, but it is the intention that the terms for approved projects shall not be less favourable than those which the applicant can obtain from other sources.

An explanatory leaflet setting out the form in which applications should be made can be obtained from the Board of Trade, Industries and Manufactures Division 2 (Revolving Fund for Industry), Horseguards Avenue, London, S.W. 1, or from Board of Trade Regional Offices.

Beneficial Changes in Insurance Scheme

NEW SYSTEM OF COMPENSATION ADOPTED

The National Insurance (Industrial Injuries) Act, 1953, which came into operation on August 26, 1953, makes a number of beneficial changes in the scheme of insurance against industrial injuries while leaving the main structure of the scheme unaltered. There is no increase in contributions.

The Industrial Injuries scheme, established by the National Insurance (Industrial Injuries) Act, 1946, came into operation on July 5, 1948. It replaced the Workmen's Compensation Act by a new system of compensation for accidents at work and for "prescribed" industrial diseases. For the first time, compensation took the form of insurance benefits under a State-administered scheme.

Immediately after the accident injury benefit can be paid for a limited period during incapacity for work. This may be followed by disablement benefit, which is either a pension or a gratuity and which depends on medical assessment of the severity of the disablement and not on loss of earnings. This benefit can be supplemented by allowances.

The main change is a relaxation of the conditions for disablement benefit. At present it can be paid only if the disablement resulting from the accident or industrial disease is substantial, that is assessed by a medical board at 20 per cent. or more, or likely to be permanent, or in some circumstances both substantial and permanent. From August 26, the benefit may be paid wherever the disablement is assessed at 1 per cent. or more, whether it is permanent or not.

People who have already had claims rejected because their disablement was neither permanent nor substantial may now claim benefit from August 26 if there is still some disablement remaining. Anyone wishing to claim from that date should notify his local National Insurance Office as soon as possible.

This change does not affect the special rules relating to persons suffering from pneumoconiosis or byssinosis.

The Act also makes the following changes:

1. It makes the hospital treatment allowance available to people awarded disablement gratuities as well as to disablement pensioners.
2. It removes a technical difficulty which at present prevents disablement benefit from being paid in certain cases from the date when injury benefit stops.
3. It enables industrial death benefit to be paid at the higher rate of 37s. a week, instead of 20s. a week, to certain widows whose husbands died as the result of an industrial accident or disease, and who are aged between 40 and 50 when they cease to be entitled to an allowance for a child.
4. It makes some minor changes in the system of adjudication.

In addition the Act gives the Minister power to make regulations for certain purposes, including

(*a*) to bring into the scheme some classes of people employed on board certain foreign ships and aircraft; and

(*b*) to make dependants' allowances available to certain unemployable people who have been receiving workmen's compensation for injuries sustained before the Industrial Injuries Act came into force in 1948.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post, but enquiries cannot be answered by telephone.

Cannery Wastes

B.6705. *We are having difficulty in disposing of the waste waters from our canning factory; can you give us any advice on this problem?* (Kent)

The waste waters incidental to fruit and vegetable canning are large in volume and high in strength. If they cannot be disposed of into sewers, biofiltration plant to fit the wastes for discharge into a stream or river may have to be installed. Research carried out at Campden and elsewhere has proved that cannery wastes may be purified to any desired extent using percolating filters and a system whereby the waste waters are diluted with purified filter effluent before being applied to the filters. The system is costly to instal, but automatic and reliable in operation.

When sewers are available for disposal of the wastes, less elaborate treatment is required and in fact physical removal of large suspended particles of debris and of sand will suffice in most case. Much good can be done by taking adequate precautions within the factory to avoid undue waste of water or materials. The object should be to prevent fruit and vegetables from entering the factory drains.

A particularly difficult problem arises when lye peeling is used but, provided care is taken to prevent vegetable matter and sand from entering the drains unnecessarily, the waste waters can still be purified by normal methods.

Fruit Fudge

B.6706. *Could you please provide me with a method for making fruit fudge?* (Lancs.)

The following formula may be used as a basis for trial:

	lb.
Tate's grade 30 sugar pieces	2·6
Corn syrup	1·5
Condensed milk	2·0
Drained cherry pieces (or other well-drained fruit)	0·2
Hydrogenated fat	0·8
Fondant	2·4
A trace of oil of almonds, or other complementary flavour according to fruit used.	

The sugar, corn syrup, condensed milk, and melted fat are pre-mixed and cooked to 244°F. The steam is turned off, the batch cooled to 200°F., and the fondant, fruit, and flavour are added and stirred evenly through the batch. It is then poured on to an oiled slab to cool and grain; it is scored while plastic, and divided into pieces when cold.

Note: The batch is cooled to 200°F. before adding the fondant to prevent streaks appearing through the fudge. Moist fruit must not be used, otherwise the batch becomes sticky.

Storage of Cider Apples

B.6707. *We should be obliged for any information you may be able to give us regarding the storage of cider apples on arrival at the factory.* (Herts.)

According to the tonnage of fruit to be stored, the method chosen should be either in bins, covered silos, or in the open air. The first method should be used only on the farm when it is desired to keep the apples until they reach optimum maturity. The industrial factory usually employs silos and it is desirable to provide some form of roofing for these to protect the apples from extremes of bad weather; the silos should be very well ventilated.

Storage in the open air cannot be recommended, for heavy rainfall will result in an appreciable loss of sugar from the apples and a noticeable diminution of their aroma and bouquet. There is also the danger of the development of moulds due to the storage of wet fruit. Movement of the apples should be done only with special shovels to avoid cutting the fruit or damaging the skin, actions which inevitably lead to the growth of moulds and bacteria in the fruit tissues. Apples stored in the open air should be protected from frost by a layer of straw.

Fruit silos should be constructed in cement with open tops, and erected side by side in rows separated by narrow partitions. If the apples are to be transported in bulk the top of the partitions should be levelled up to the height of the surrounding pathway. The cement floor, sloping adequately to a central channel through which the water flows for conveying the fruit, is covered with a grating which ventilates the fruit—an effect which can be increased by the placing of vertical "chimneys" at intervals throughout the silo. Enough fruit should be stored for five to 10 days' work. The area required can be calculated from this tonnage; the depth of fruit should not usually be less than 3 ft. and never exceed 4 ft. 6 in. The width of the silo, however, can be as much as 18 ft.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.6653. *Glacé cherry packing equipment.* (Scotland)
B.6654. *Roasted and salted peanuts.* (Scotland)
B.6655. *Sausage linking equipment.* (London)
B.6657. *Synthetic cream.* (Canada)
B.6659. *Cleaning device for food containers.* (Lancs.)
B.6660. *Vacuum closing of glass jars.* (Singapore)
B.6662. *Compressors and vacuum pumps.* (America)
B.6663. *Water atomisers.* (Wilts.)
B.6664. *Income tax relief.* (Ches.)
B.6667. *Chicken in glass.* (Northumberland)
B.6670. *Pea steeping tablets.* (Warwicks.)
B.6671. *Lactic acid.* (Devon)
B.6672. *Tomato powder and tomato flavouring.* (Ireland)
B.6674. *Refining beef fat.* (Kenya)
B.6676. *Anchovy essence.* (Lancs.)
B.6677. *Fruit juice equipment.* (East Africa)
B.6678. *Cartons.* (Glam.)
B.6679. *Gauge for testing the vacuum in canned foods.* (Surrey)
B.6681. *Meat canning.* (Warwicks.)
B.6683. *Pop corn manufacture.* (London)
B.6684. *Liver catalase.* (Beds.)
B.6685. *Sugar confectionery.* (Philippines)

Information Required

B.6682. *Suppliers of a hand-operated peeler for citrus fruits.* (Staffs.)
B.6704. *Name and address of the manufacturers of the Moorside sharpening stone.* (Yorks.)

Recent Patents

694,344. KATO, S.: Treatment of fruit prior to refrigeration.
694,449. VICARS, LTD., T. AND T.: Dough breaks.
694,471. LAMB, H. T.: Electrically driven machines for mixing and kneading or for mincing.
694,481. ST. REGIS PAPER CO.: Bag filling machines.
694,597. SEARLE, M. A., and JOHNSON, R. M.: Vitamin coated table salt.
694,599. AKTIESELSKABET TOMS LABORATORIUM: Method of extruding chocolate and the like and a device for extruding chocolate and the like.
694,617. NAAMLOOZE VENNOOTSCHAP ALGEMEENE NORIT MAATSCHAPPIJ: Process for the purification and decoloration of liquids, especially sugar solutions.
694,620. MID-WEST BOTTLE CAP CO.: Bottle closures.
694,720. BARRACLOUGH, LTD., R. W., and BARRACLOUGH, R. W.: Machines for bagging confectionery and like commodities.
694,723. TILTMAN LANGLEY LABORATORIES, LTD.: Apparatus for drying of green crops.
694,749. FOOD MACHINERY AND CHEMICAL CORPORATION: Methods and apparatus for cooling sealed food containing cans in continuous sterilisation processes.
694,786. LESAFFRE ET CIE.: Method of manufacturing aerated yeast.
694,943. MERCK AND CO., INC.: Preparation of vitamin B_{12}.
694,947. SMETHURSTS GRIMSBY LTD., SWALLOW, M. C., WARD, J. B., and WARD, F. W.: Cooking of pieces of foodstuff in batter.
694,970. IMHAUSEN AND CO., GES., and IMHAUSEN, K. H.: Production of fats.
695,024. BRAUNSCHWEIGER, GES. FUR ANGEWANDTE ELEKTRIZITAT: Apparatus for the sterilisation and pasteurisation of liquids.
695,140. ROSEFIELD PACKING CO.: Stabilised peanut butter.
695,145. JEWELL, P. S., INGRAM, G. C., and KING, J. G. T.: Production of ingredients for foodstuffs.
695,203. DAVIES, D. R.: Apparatus for dispensing cylindrical articles, for example drinking straws.
695,204. VICARS, LTD., T. AND T.: Application substances to biscuits and like articles.

ABSTRACTS OF BRITISH PATENTS

Conching Chocolate

The chocolate or like mass is set in rotary or whirling motion so as to be spread out in a thin film by the action of centrifugal force.

It has been found that this method results in satisfactory conching with substantially smaller consumption of energy per unit of the conching mass than by the methods hitherto known. The mass may be spread over a plurality of rotary discs and since centrifugal force effects the spreading of the mass over the discs the advantage is gained, among others, that the thickness of the layer or film on the discs can be varied at will, simply by adjusting the speed of revolution of the discs.

Furthermore, a considerable number of rotary discs or like bodies may be used, over which the mass can be spread successively, so that the conching process may be completed during a single passage of the mass through the conching machine.

Preferably, at least part of the conching air is admitted in the vicinity of the axis of rotation of the rotary disc bodies and withdrawn from the vicinity of the periphery thereof. This central air supply is of importance for two reasons. Firstly, the sweeping motion of the air over the layer on the discs thereby takes place generally in the same direction as the spreading of the mass proper, so that the air will not impede the motion of the mass over the disc and, secondly, the central air supply ensures that air flows over the entire disc surface and not merely in an outer annular zone, which would be the case if all the air for the conching were supplied at the periphery of the rotary discs.

A machine is described for carrying out the above method, which comprises a plurality of discs or like bodies mounted for rotation about a substantially vertical axis, each having a face over which the mass is spread, the disc bodies being so arranged that the mass is spread over the faces thereof successively.

685,149. *Mikrovaerk A/S.*

Production of Laminarin and Glucose

A process is described for the production of laminarin, and glucose therefrom. In the example given 500 parts by weight of 0·05 N hydrochloric acid are added to 50 parts by weight of dried, milled *L. cloustoni* fronds. The mixture is immediately adjusted to *p*H 2·4 by adding 18 parts by weight of N hydrochloric acid and is then agitated for about 30 minutes. The mixture is thereafter centrifuged, and the centrifugate allowed to stand, whereupon the laminarin crystallises out.

In this way, in a single treatment it is possible to remove 91 per cent. of the laminarin from the weed and recover 65 per cent. of the total laminarin.

A further quantity, that is the remaining 26 per cent. of laminarin, can be obtained from the mother liquid by evaporation and/or precipitation with alcohol. The laminarin is then purified by recrystallisation from hot water.

For the purpose of obtaining glucose from laminarin, 50 parts by weight of laminarin are dissolved in 230 parts by weight of 0·05 N hydrochloric acid and the mixture is heated in an autoclave at 135°C. for one hour to give 52 parts by weight of glucose in the hydrolysate.

For the purpose of isolating glucose from the mixture, the foregoing hydrolysate is centrifuged, and the centrifugate is neutralised by any of the known methods to bring the *p*H between 4 and 5. The mixture is thereafter filtered, the filtrate is decolorised with charcoal, and the mixture is separated from the charcoal and evaporated under reduced pressure. The resulting syrup is dissolved in 240 parts by weight of hot methanol, the mixture is centrifuged, and the centrifugate is thereafter allowed to stand, whereupon the glucose crystallises out in the normal manner. Alternatively, the foregoing syrup can be dissolved in water, and the glucose isolated by any of the known methods.

690,685. *Scottish Seaweed Research Association.*

British patents and trade marks have been selected from the "Official Journal of Patents" and the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

The Preservation of Vegetable Products

The preservation of vegetable products stored in a substantially gas-tight container can be achieved by substituting at least part of the ambient air in the container with an inert gas such as nitrogen so that an atmosphere is produced therein of a required oxygen content, by removing at intervals carbon dioxide produced in the container by the vegetable products, and by replacing at intervals the oxygen absorbed by the vegetable products.

Apparatus for carrying out the process includes a container which is substantially gas-tight, means for admitting an inert gas such as nitrogen to the container, means for withdrawing from the container carbon dioxide produced by the vegetable products, and means for admitting oxygen to the container to maintain the oxygen content at the required value.

691,682. *Rodolfo Oesterle.*

Manufacture of Tablet Jellies

If an aqueous dispersion of low methyl pectin and a suitable sweetening agent are introduced into an aqueous solution containing a suitable concentration of a soluble edible salt of a polyvalent metal, preferably calcium, in the presence of an edible acid, an attractive and satisfactory tablet jelly can be produced.

It is preferable to add the suitable acid to the solution of the polyvalent metal salt and then introduce the pectin dispersion into this solution.

The quantity of the salt of the polyvalent metal required in the process cannot be definitely stated and must be adjusted by experiment to suit the "calcium," or other polyvalent metal "tolerance" of the particular sample of pectin used. Thus, if insufficient polyvalent metal ion is present the jelly formed will be weak; if the polyvalent metal ion concentration is too high the jelly will be found to exhibit syneresis.

The amount of polyvalent metal salt required appears to depend mainly on the following factors:

1. The nature of the polyvalent ion used.
2. The nature of the low methyl pectin sample used.
3. Nature of the fruit juices and/or acids used.

Accordingly it is necessary to carry out a few preliminary trial experiments to determine the proportion of metal salt and other conditions for the particular pectin to be used so that a tablet jelly of 68 to 80 per cent. soluble solids content is obtained. In general it is preferable to adjust the soluble solids content to approximately 76 per cent.

691,782. *Chivers and Sons Ltd.*

ABSTRACTS OF GERMAN PATENTS

Food Preservation

A method of preserving food, such as fish or meat, is described in which the food is heated in a closed container above 100°C., the food being rolled in a pulverulent water-absorbing and water-binding material before preserving, or sprinkled with this material, which remains as a gel.

836,733. *Marinus Johannus van der Hoeven and Michiel Petrus Verhaart.*

Trade Marks

JEWEL.—705,970. Food products containing cheese as a main ingredient. **Swift and Company** (a Corporation organised and existing under the laws of the State of Illinois, United States of America), Union Stock Yards, Chicago, Illinois, United States of America; Manufacturers.

HP.—709,865. Vinegar. **H.P. Sauce, Limited,** H.P. Sauce Works, Tower Street, Aston Cross, Birmingham, 6; Manufacturers.

FLAG.—710,569. Sauces, vinegar, tomato ketchup, chutney, salad cream, and mint in vinegar. **Fardon's Vinegar Company, Limited,** The Brewery, Glover Street, Birmingham, 9; Manufacturers.

CRISCAX.—713,199. Compounds of fats and oils prepared for use as ingredients in the manufacture of chocolate to prevent the formation of bloom. **A/S Danish Milk and Cocoa Products, Limited** (a Company incorporated under the laws of Denmark), 4, Amaliegade, Copenhagen, K, Denmark; Manufacturers and Merchants.

BEAR BRAND.—713,388. Sugar confectionery, eating chocolate and chocolates, none being medicated. **Blooms (Confectioners), Limited,** 162, Tooting High Street, London, S.W. 17; Manufacturing Confectioners.

BABKA.—714,065. Flour, bread, biscuits (other than biscuits for animals), cakes, pastry, and non-medicated confectionery. **Mary Oliver and Thomas Dakowski,** trading as **Daquise Restaurant,** 20, Thurloe Street, South Kensington, London, S.W.7; Merchants.

PAMHAM.—714,213. Ham and meat products made from ham. **Naamloze Vennootschap Koninklijke Stoomvleeschwarenfabriek Van B. Linthorst and Zonen** (a Joint Stock Company organised under the laws of Holland), 95, Molenstraat, Wilp, Gelderland, Netherlands; Manufacturers and Merchants.

CHIKOLET.—715,085. Chicken soup and preparations for making chicken soup. **Ralph Etherington,** 151, Latymer Court, London, W.16; Manufacturer.

KONG.—715,474. Butter and cheese. **Dairy Produce Packers, Limited,** 51, Tooley Street, London, S.E.1; Merchants.

CHAM.—715,722. Chopped ham. **K. Lowie and Sons, Limited,** 2-4, Moye Street, Shoreditch, London, E.2; Merchants.

UPERISATE.—715,980. Milk, dairy products (for food), jellies (for food), preserved fruits, and preserved vegetables. **Alpura A-G.** (a Joint Stock company duly organised under the laws of Switzerland), Neuengasse 39, Berne, Switzerland; Manufacturers and Merchants.

ZIPPY.—716,214. Ice cream wafer biscuits. **J. Lyons and Company, Limited,** Cadby Hall, London, W. 14; Merchants and Manufacturers.

PNEU-FLOW.—716,612. Flour milling machinery and parts thereof. **Thomas Robinson and Son, Limited,** Railway Works, Rochdale, Lancs.; Manufacturers.

PARVOX.—716,698. Meat extracts, vegetable extracts; and fruits and vegetables, all preserved, dried or cooked. **Lloyd Rakusen and Sons, Limited,** 20, Meanwood Road, Leeds, Yorks.; Manufacturers.

GOLDEN MARIE.—716,722. Cheese and butter. **John Martin of London, Limited,** 14, Seething Lane, London, E.C.3; Manufacturers and Merchants.

WEELADDIE. — 716,761. Biscuits (other than biscuits for animals). **Danubia Bakeries, Limited,** 62, Herries Street, Queens Park, London, W.10; Manufacturers and Merchants.

BYSOL.—716,812. Starch (for food). **J. T. and H. Bythway, Limited,** Danlee Buildings, 53, Spring Gardens, Manchester, 2; Manufacturers.

ALDOROL.—717,358. Flavourings (other than essential oils). **W. J. Bush and Company, Limited,** 28, Ash Grove, Hackney, London, E.8; Chemical Manufacturers.

TWINING'S.—717,790. Tea, coffee, cocoa, and chocolate. **R. Twining and Company, Limited,** 216, Strand, London, W.C.2; Merchants.

STORMY PETREL.—717,917. Canned fish, canned meats, canned fruits, and canned vegetables. **Antony Worham, Limited,** 19, Eastcheap, London, E.C.3; Produce Importers.

EXTRACOA.—718,031. Edible oils. **Loders and Nucoline, Limited,** Unilever House, Blackfriars, London, E.C.4; Manufacturers.

POLAPAK.—718,277. Dead poultry, dead game, and dead rabbits. **Polpak Distributors, Limited,** Church Road, Boreham, Nr. Chelmsford, Essex; Processors and Packers.

BARBSYRUP.—718,814. Syrups for food (not medicinal and not for making beverages). **George Clark and Son, Limited,** Broadway Works, Millwall Docks, London, E.14; Manufacturers.

COCKATRICE.—718,941. Meat, fish, game, and poultry, all being preserved. **Gaylord House, Limited,** Gaylord House, Rennie Street, Salford, 5, Lancashire; Food Canners.

New Companies

Wilsons Foods, Limited. (520186.) Bradman Road, Kirkby Trading Estate, nr. Liverpool. To carry on business of manufacturers, preservers, packers, canners and bottlers of and dealers in vegetable and horticultural products, meat, etc. Nom. cap.: £15,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: A. D. Flather, 39, Durham Road, Bradford (solr.), and W. E. Wilson, 27, The Headrow, Leeds.

G. Orlik (Meat Products), Limited. (520269.) 42, Tottenham Street, London, W.1. To carry on business of manufacturers, manipulators and dealers in food, provisions, groceries, meat extracts, etc. Nom. cap.: £300 in 5s. shares. Dir.: G. E. Orlik, 62, Tarranbrae, London, N.W.6.

Wilton Sunshine Fruits Company, Limited. (521197.) Wilton Lane, Kenyon, nr. Manchester. To carry on business of canners, tinners, bottlers, packers, and preservers of and dealers in fruit, fruit juices, etc. Nom. cap.: £3,000 in £1 shares. Dirs.: J. S. Isherwood and Mrs. M. C. Isherwood, West Looe, 74, Twiss Green Lane, Culcheth.

C. M. McKenning and Company, Limited. (521246.) Kent House, 447, Handsworth Road, Sheffield, 13. To take over business of a potato crisp manufacturer and distributor carried on as "C. M. McKenning" at Sheffield. Nom. cap.: £1,000 in £1 shares. Dirs.: C. M. McKenning (permt. mang. dir. and ch.), N. W. Hemming, and Winifred G. Hemming, all of Kent House, 447, Handsworth Road, Sheffield, 13.

E. Hicks and Son (Casings), Limited. (521253.) To carry on business of sausage casing manufacturers, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: Mrs. S. Hicks, Ronwyn, Uplands Estate, Tavistock, Devon, and R. E. Hicks, Sherma, Uplands Estate, Tavistock, Devon.

J. Forman (Salmon Curers), Limited. (521310.) Devonshire Chambers, 146, Bishopsgate, London, E.C.2. Nom. cap.: £2,000 in £1 shares. Dirs.: J. Forman and Mrs. Y. H. Forman, 26, Renters Avenue, Hendon, London, N.W.4.

Burbidge, Pritchard and Bartleet, Limited. (521315.) To import, export, blend, taste, manufacture, treat, and prepare for market, tea, coffee, cocoa, and other food beverages, etc. Nom. cap.: £20,000 in £1 shares. Dirs.: not named. Subs.: H. Riley, 4, Windsor Court, London, W.2, and C. H. Trewell, 3, Osterley Court, Great West Road, Isleworth, Middlesex.

Manuels Frosted Foods, Limited. (521849.) To carry on business of growers, importers, exporters, canners, bottlers, and processors of frozen and other foodstuffs, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: B. R. Manuel, 16, Golders Green Crescent, Golders Green, London, N.W., and L. E. Manuel, 16, Woodward Avenue, Hendon, London, N.W.4.

Harrisons Egg Packers, Limited. (522222.) Fir Tree Farm, Middleton, Pickering, Yorks. Nom. cap.: £5,000 in £1 shares. Dirs.: W. Harrison and Mrs. J. Harrison, Stone Garth, Middleton, Pickering, Yorks.

Paul Grant, Limited. (522230.) Evelyn House, Room 16, 62, Oxford Street, London, W.1. To carry on business of manufacturers of and dealers in chocolates, boiled and other sweets, ice cream, aerated and mineral waters, toys, games, cigarettes, cigars, and tobacco, etc. Nom. cap.: £100 in £1 shares. Dirs.: P. Grant, 50, Donnington Road, London, N.W.10, and W. F. Bowker, 64, Moray Road, London, N.4.

A. and V. J. Kay (Sales), Limited. (522253.) Back Boothley Road, Blackpool. To carry on business of bakers and manufacturers of and dealers in bread, biscuits, farinaceous compounds, etc. Nom. cap.: £500 in £1 shares. Dirs.: A. Kay and Mrs. V. J. Kay, 51A, Boothley Road, Blackpool.

Elkes Biscuits (London), Limited. (522332.) 55, Charterhouse Street, London, E.C.1. Nom. cap.: £10,000 in £1 shares. (5,000 "A" and 5,000 "B"). Dirs.: not named. Subs.: Elkes Biscuits, Ltd., Clydesmuir Road, Cardiff, and Keevil, Ltd., 240, London Central Markets, London, E.C.1.

Adel Bakery, Limited. (522401.) 54, Merrion Street, Leeds, 2. To carry on business of biscuit manufacturers, bakers, confectioners, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: Edith Pashley and Mary Marritt, 473, Otley Road, Adel, Leeds; and E. S. Pashley, 15, Spen Drive, Leeds, 6.

Jack Curtis and Son, Limited. (522431.) 2, Station Road, Ilford, Essex. To carry on business of manufacturers of and dealers in cooked and prepared foods and foodstuffs, etc. Nom. cap.: £1,000 in £1 shares (500 cum. pref.). Dirs.: A. E. S. Curtis (permt. mang. dir.), Mrs. E. H. M. C. Curtis, and W. S. Curtis, all of 16, Mount Ephraim Road, Tunbridge Wells, Kent.

Richland Pure Food Company, Limited. (522484.) National Provincial Chambers, Silver Street, Hull. Nom. cap.: £1,000 in £1 shares. Dirs.: F. D. Storry, 6, Granville Terrace, New Ellerby, E. Yorks., and H. Morgan, 31, Northgate, Cottingham, E. Yorks.

From Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.